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A MONOGRAPHIC STUDY OF THE GENUS PRITCHARDIA

By ODOARDO BECCARI and JOSEPH F. ROCK

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(WITH PLATES I-XXIV)

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Prepared by Joseph F. Rock while Professor of Botany in the University of Hawaii. Published by the Bishop Museum by permission of the University.

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A MONOGRAPHIC STUDY OF THE GENUS PRITCHARDIA.

By Odoardo Beccari and Joseph F. Rock.

INTRODUCTION.

By Joseph F. Rock.

THE present study of the genus *Pritchardia* is mainly the work of Dr. O. Beccari of Florence, Italy, and forms part of a monograph on the tribe *Coripheae* to which the genus *Pritchardia* belongs. The manuscript was prepared in Latin for publication in the Annals of the Calcutta Botanical Garden, but Dr. Beccari has consented to have that part of his monograph dealing with the genus *Pritchardia* published in English in Honolulu. Of the thirty-three species described in this paper twenty-one including five varieties were discovered by me, and several old species were rediscovered and their status cleared. My recent explorations on the islands of Kauai, Molokai, and Hawaii resulted in the discovery of several new species and one new variety. Specimens of these and of other new species were forwarded to Dr. Beccari, but I am responsible for the description of the following: *Pr. kaalae, Pr. Forbesiana, Pr. Hardyi, Pr. Munroi, Pr. montis-kea, Pr. viscosa, Pr. Lowreyana* var. *turbinata, Pr. Martiodes,* and *Pr. Kahanae.* Plates illustrating this monograph are from photographs taken by me; the drawing of the flowers was made by Dr. Beccari. It is hoped that the present paper will be a stimulus to further exploration by future botanical workers, for it is probable that the Hawaiian Islands harbor a number of other new species of *Pritchardia.* Special attention should be given to the western part of Oahu, the windward side of Molokai, especially the valleys of Waikolu, Pelekunu, and Wailau, and to the windward slope of Haleakala on Maui. On the island of Hawaii, Waipio, Waimanu, and other valleys of Kohala have not been searched for palms, and the island of Kauai may reward the assiduous explorer with additional new species. I desire to express my sincere thanks to Mr. W. R. Castle, Mr. C. M. Cooke, Jr., Mrs. J. R. Galt, Mr. F. J. Lowrey, the Outdoor Circle, Miss Annie S. Parke, Mrs. F. M. Swanzy, Mr. E. D. Tenney, Mr. John Waterhouse, and the Trustees of the Bishop Museum for generous contributions to the expenses for field study and publication. Thanks are also due to Dr. Beccari for his kindness in permitting publication of his manuscript prior to its appearance in the Annals of the Calcutta Botanical Gorden.[1]

[1] The scientific world has suffered a severe loss in the death of Dr. Beccari which occurred at Florence, Italy, Oct. 25, 1920.

PART I.—DISTRIBUTION AND CHARACTERISTICS.

General Discussion.

By Odoardo Beccari.

DISTRIBUTION.

THIS fine group of palms, of which up to a quite recent date but few representatives were known, now numbers thirty-one well characterized species and some very distinct varieties.

This great increase in the number of known species of *Pritchardia,* is chiefly due to the recent discoveries of Professor Joseph F. Rock of the College of Hawaii, who has carefully explored the islands composing the Hawaiian group, in search of their indigenous palms and has been extraordinarily successful in discovering a large number of new and fine species, of each of which he has taken special care both to collect and prepare complete specimens in flower and in fruit.

This material, generously placed at my disposal by Professor Rock, forms the principal basis of the present monograph.

The Pritchardias constitute one of the most characteristic genera of palms belonging to the Polynesian Flora, which, with some of its scattered members, occupies a very extensive geographical area in the islands of the Pacific, but has attained its greatest development in the Hawaiian archipelago. With the exception of *Pritchardia,* no other genus of palms occurs in Hawaii, although the western Polynesian islands contain a good number of others.

The Pritchardias first described were *Pr. Martii* and *Pr. Gaudichaudii,* both from Hawaii, and were considered as belonging to the genus *Livistona.* The generic name *Pritchardia* was afterwards established for a palm growing in the Fiji Islands, *Pr. pacifica,* and it was later discovered that *Livistona Martii* and *L. Gaudichaudii* were referable to the genus *Pritchardia* of which *Pr. pacifica* is the type. Another *Pritchardia, Pr. Thurstonii,* was also found in Fiji. Perhaps some other palms akin to these are living in the archipelagos nearest to Fiji. Two species have been found in the distant Dangerous Archipelago (*Pr. Vuylstekeana* and *Pr. pericularum*), but at least twenty-three well distinguished species, that is 74 per cent of all the genus are endemic in the Hawaiian group. A very characteristic *Pritchardia, Pr. Wrightii,* has found its way into the new world. This is one of the most extraordinary facts known of geographical distribution of palms, comparable to the presence in America of a Raphia, but even more to that of the characteristic Coccinea in South Africa, the *Jubacopsis Caffra.*

Pritchardia Wrightii is a palm which grows only in Cuba and near the southern coast of the little Isla de Pinos. This palm, although distinguished among

all its congeners as a species, is so similar to them in leaf-structure, flowers, and fruits, that it is impossible not to admit that this species had a common origin with them. It is also a singular fact, unique to my knowledge among the palms, that the three segments of the corolla detach themselves from the corolla tube at the moment of flowering, leaving the stamens uncovered, in *Pr. Wrightii* in exactly the same manner as in all its congeners.

In what manner the fruits of the progenitrix of *Pr. Wrightii* were enabled to cross the wide spaces of ocean, interposed between the nearest Polynesian Islands inhabited by the *Pritchardia* and the American continent, is a mystery. And this mystery is greatly increased by the fact that these fruits must have surmounted the mountain chain which separates the Pacific from the Atlantic, unless we assume that in some more or less remote geological epoch, the configuration of the western coast of the American continent, was very different from what it is at present, and that the vast expanse of the Pacific was broken by lands now submerged, thereby lessening the immense distances now interposed between the most eastern islands of Asia and the New World.

I am willing to admit with Guppy[1] that the dispersal of the fruits of many plants may have been assisted locally by pigeons, and that through their agency, the geographical area of the *Pr. pacifica* may have been amplified, and even that by such means forms related to that species may have been produced. In the special case of *Pr. Wrightii* one may perhaps suggest the hypothesis, already put forth by me,[2] of the transfer of the fruits of certain plants by means of the violent volcanic phenomena which must surely have occurred during the elevation of the Andean ranges. Nor is the probability to be excluded, that at such a time a communication by water may have been established between the two oceans, and that the fruits of a *Pritchardia* of Polynesia may have been carried to, and finally deposited on, an island in the Caribbean Sea. Guppy however supposed that even the fruits of the large-fruited species of the Hawaiian Islands may have been transported by ocean currents, as he notes that those of *Pr. Gaudichaudii* are of such a nature as to allow them to float for at least five weeks. But that this and other Hawaiian species with similar large fruits can have originated from small fruits such as those of the Fijian *Pr. pacifica* and *Pr. Thurstonii,* I find it hard to believe. It seems to me more likely that the opposite is the truth, that is, that the Fijian species may have been derived from those of Hawaii, and also that the two species of the Dangerous Archipelago may have been derived from the same source.

There is not a shadow of doubt that the Pritchardias are generically closely related to the Asiatic *Corypheae, Livistona* and *Licuala,* and especially to the *Pritchardiopsis* of New Caledonia; but on the other hand the genera *Washingtonia, Brahea, Erythea,* and *Copernicia,* all proper to the western part of North America, exhibit an equal degree of affinity to the Pritchardias. If one considers the great

1 Guppy, H. B., Observations of a Naturalist in the Pacific, vol. II, p. 326, 1906.

2 Malesia, vol. III, p. 303.

scarcity, indeed the almost total absence of *Corypheae,* in all the Polynesian archipelagos, with the exception of *Pritchardia* and *Pritchardiopsis,* we may regard the latter as surviving members of a type of palms, once widely diffused, but now almost wholly swallowed up with the hypothetical lands of the Pacific.

The great precinctiveness of the species of *Pritchardia* in Hawaii proves that their dispersal, even locally, is difficult. No species of *Pritchardia* is found represented on more than one island. It happens sometimes, however, that ripe fruits of some species of *Pritchardia, Gaudichaudii* for instance, falling on the ground take root around the mother plant and form small stands when they grow up. *Pr. Beccariana* alone according to Professor Rock is to be met with as numerous scattered individuals in the rain forests of Glenwood on Hawaii. But more often the trees of *Pritchardia* grow isolated, and at heights varying from 1,000 to 1,200 meters on inaccessible cliffs, exposed to terrific winds. According to Professor Rock, certain species of *Pritchardia* on Hawaii are found in the dark forests, growing among stately trees, while on the lee side of that island, they come down to 600 meters and even lower, near the sea level. On Oahu the palms are confined to the summits of ridges and to the steep slopes of valleys. The more or less globose fruits of some isolated trees may fall on the ground, roll down to the bottom of the ridge or slope where they grow, and be carried by heavy rains into the valleys below, or be caught in some crevice of the rocks; but how those palms which wave the crown of their leaves against the sky on the crests of the most inaccessible ridges, have managed to establish themselves at such a height, and what can have carried their seeds thither is as yet a puzzle. The fruits of some species, such as *Pr. Hillebrandi* and *Pr. affinis,* have a moderately fleshy mesocarp of pleasant taste, which recalls that of a date. They are small enough to be swallowed for the sake of the pulp by pigeons, such as *Myristicivora* and *Carpophaga;* these birds indeed are among the most effective agents of dispersal of the fruits of many plants in Papuasia and Polynesia. They are however unknown in the Hawaiian Islands. On the other hand it must be acknowledged that the palms which produce the above mentioned kind of fruits, especially *Pritchardia affinis* and its varieties, are the more diffused species and are represented by allied forms on islands even at a distance from the central group, such as *Pr. remota* from Nihoa or Bird Island, to say nothing of *Pritchardia lanaiensis.* Perhaps also the two species of the Dangerous Archipelago are related to *Pr. affinis.*

In consequence of these considerations it is allowable to suppose that at some time, when greater terrestrial connections existed between the remoter islands of eastern Polynesia and those of Papuasia and occidental Polynesia, the Columbidae may have been the agents which contributed even more than ocean currents to stock with palms the islands of the Hawaiian group; but as I have pointed out[3] no species of *Ficus* form part of the indigenous Hawaiian flora, while the fruits of these trees are among the best liked by that family of birds. If the Columbidae

3 Malesia, vol. III, p. 316.

had been one of the means by which some elements of the western Polynesian flora were introduced into the Hawaiian Islands, one does not understand why no species of *Ficus* has found its way there. And then, by what means were the large fruits of *Pr. Beccariana, Pr. arecina, Pr. Rockiana, Pr. Gaudichaudii, Pr. Lowreyana, Pr. macrocarpa,* enabled to reach high mountains, even their most inaccessible summits? One really cannot conceive what agency can have transported thither such relatively voluminous fruits. It is a fact absolutely opposed to what happens on the high Malayan mountains, where only plants having very small seeds, easily transported by winds, or sought for by birds or other animals, have succeeded in establishing themselves. At times the natives plant some Pritchardias near their dwellings, but there is certainly no reason to think that they planted palms in places inaccessible to themselves. At present it does not seem that any terrestrial animals exist that feed on the fruits of the Pritchardias, and contribute, even indirectly, to their dissemination by carrying their fruits into nests or hiding places, such as the crevices of rocks, as do squirrels or rats. Yet it is possible that in the past this work was performed by a species of rat (*Rattus hawaiiensis*), now generally believed extinct, but which Professor Rock informs me, has been found on an islet off the coast of Oahu.[4] The rats now met with in the Hawaiian group have only been introduced there since the days of ocean shipping. Another animal of recent introduction into this group is the mongoose (*Herpestes*), which seems, however, to contribute more to the destruction of the Pritchardias than to their preservation and dissemination. At least this appears to be the case. The immature fruits of *Pr. Martii,* at least, are destroyed by the mongoose to a degree that makes it difficult to procure ripe fruits for the purpose of propagation.

To give a probable account of the geographical distribution of the Pritchardias, it may be necessary to have recourse to the hypothesis that during a former epoch the fruits of certain species or genera of plants which possessed great facilities for reproduction were transported from one island to another by means of ocean currents or by birds—a hypothesis which involves the assumption that during this hypothetical epoch the enormous distances which now exist between the island groups in the Pacific were bridged by means of islands which have now vanished.

We cannot refuse to admit that the present geological structure and configuration of the islands forming the Hawaiian archipelago are very different from those which existed before great seismic cataclysms raised the present mountains and broke the original land into fragments. We can picture to ourselves a period of geological calm in which the area now occupied by the Hawaiian Islands was a flat plain like the Aru Islands, without volcanic cones or precipitous mountains.

This period corresponded probably to an epoch in which the various fragments of land scattered in the Pacific, the Hawaiian group being among them, were

4 Stone, Witmer, The Hawaiian rat. Stokes, J. F. G., Notes on the Hawaiian rat: Bishop Museum Occasional Papers, vol. III, No. 4, 1917.

less isolated than now. During that epoch the fruits of the primitive Pritchardias, and also of other tropical plants, may have been deposited here and there on the islands of the group, by birds, ocean currents or even winds, thus creating a special vegetation; but when the great seismic and eruptive period arrived, the vegetation which covered the plains may have been carried, in part at least, on the mountains which were rising, and to a certain extent may have been preserved upon them. With this hypothesis a part of the vegetation now existing on the Hawaiian mountains could be considered as a surviving element of that which covered their plains before the advent of the great cataclysms which completely changed the orographical structure of the region.

FERTILIZATION.

The flowers of the Pritchardias open in an unusual manner. Their corollas apparently perform one function only, that of sheltering the sexual organs. They serve no vexillary purpose; that is to say, of attracting insects or birds. The flowers are small, and only by their *ensemble* may attract those creatures who know their meaning. The three segments of the corolla become detached from the tubular portion projecting from the calyx, and drop at anthesis, that is when the anthers are ready to scatter their pollen grains.[5] This mode of flowering is perfectly analogous to that of certain *Ampelideae* and *Araliaceae*. The petals having fallen, the anthers, borne on short filaments, radiate from the mouth of the tube of the corolla and around the style, which projects more or less from the stamens. This contrivance seems to be very favorable to the impollination of the ovaries by bees or other flower-haunting insects, as in *Vitis* and *Hedera*. Perhaps also as in the flowers of these plants some special odor, imperceptible to our senses, serves to attract insects from a distance.

I have no positive observations in regard to any saccharine secretion in the flowers of the Pritchardias, as it is not easy to verify this occurrence from dry herbarium specimens. To tell the truth, though the tube of the corolla of the Pritchardias is of such a conformation that it might be taken for a recipient fitted for collecting nectar, and even its side walls, which are somewhat thick, would suggest a nectarifluous structure, yet in all the flowers examined I have not met with any trace of a saccharine secretion.

The pollen grains of *Pr. affinis,* which I have examined with the microscope, are, in the dry state, ellipsoidal in shape with a deep longitudinal fold, but when swelled by immersion in water, assume an ovoid-ellipsoidal or even subglobose shape; their surface is perfectly smooth, without asperities or prominences. Nevertheless the grains seem to have a tendency to agglutination, and appear to belong to the type of pollen grains best adapted to be collected by insects adhering to the body of any animal which might be in the habit of frequenting flowers, rather than to the type of pollen grains easily transported by winds. This appearance, which I have

5 Malesia, vol. II, t. XXXVIII, f. 1-3.

met with in the pollen grains of *Pr. affinis,* is probably common to all species of *Pritchardia,* considering the very small differences existing among their flowers. According to Professor Rock, the flowers of Pritchardias are much frequented by bees, wasps, and other insects; hence it is not improbable that birds also visit them to capture those insects; yet if the flowers of these palms do secrete a nectareous juice, it is presumable that the *Drepanidi,* the family of birds so peculiar to the Hawaiian Islands and which possesses a form of beak especially adapted for extracting nectar from the flowers of various plants, visit the Pritchardias as well, thus contributing indirectly to their fertilization.

It is also possible that some Pritchardias may produce two qualities of flowers from the same spadix; flowers which in appearance morphologically conform, but which are in fact functionally different. And with respect to this, Professor Rock has pointed out to me that in *Pr. Beccariana,* in *Pr. Martii,* and perhaps in some other species, only the uppermost branch of every spadix produces the fruits, while all the flowers on the lower branches fall off. Hence in these species we have spadices of a clearly heterogamous nature. But in the specimens of *Pr. Beccariana* examined I have not discovered any organic difference between the flowers from the lower branches and those from the upper part of the same spadix.

STRUCTURAL PECULIARITIES.

The diagnostic characteristics of the species of Pritchardia are found chiefly in the fruit, and in the indumentum which covers the leaves and the spadices. Characters which might serve to distinguish one species from another are hard to find in the flowers, as these conform to one type, with slight differences in size and in the venation of the calyx and of the corolla. Only *Pr. Wrightii* differs from the Polynesian species, its flowers being of a more fleshy nature than those of others of the entire group.

The leaves of *Pritchardia* are without stomata in their upper surface but almost always show some special covering or clothing on the lower. Only in a very few cases are they equally green and bare on both faces. The indumenta which cover the leaves and other parts of the plant are of two different kinds. One consists of a thin waxy coating, which takes the appearance of a fine white powder, easily removed, and which imparts to the petioles, to the backs of the leaves, and to parts of the spadices a powdery and glaucous shade more or less pronounced, as in *Pr. Thurstonii, Pr. Hillebrandi, Pr. Maideniana,* and *Pr. insignis.* The other far more common indumentum is due to the presence of a special kind of hairiness, or of dots like orbicular or oblong or variously shaped scales, which I have distinguished with the name "lepidia"[6] and which are present on the leaves of many other palms. When the lepidia are very close together they form a complete covering, touching each other with their marginal cells, which in some cases take the shape

[6] Webbia, vol. IV, p. 366, 1913.

of hairs, and contribute to form a continuous and thick felted clothing.[7] In this latter case the lower surface of the leaves has a silvery or even subaureous appearance, as in *Pr. Rockiana, Pr. arecina, Pr. eriophora,* and *Pr. minor.* The greater or lesser abundance of the waxy coating, of lepidia, or of tomentum, whether on the leaves or on the spadices, should, I believe, be taken as the effect of the climatic conditions under which a plant is obliged to live, but perhaps depends to a still greater degree on the conditions of the environment in which the species was originally formed.

Species having glaucous and waxy leaves, such as *Pr. Hillebrandi* and *Pr. insignis,* may be presumed to be still influenced by the dry climate in which they were originally formed, the waxy coating being one of the most characteristic peculiarities of xerophilous plants. In the Hawaiian Islands the great rains and the thick shadows of the damp and wet forests seem to have been if not the only cause the most active stimulus in producing the subaureate or silvery clothing in the leaves of *Pr. Rockiana, Pr. arecina; Pr. eriophora, Pr. minor;* and *Pr. eriostachya* The upper surface of the leaves of these species is green and devoid of any kind of hairiness and also of stomata. The hypothesis would therefore appear plausible that the great difference existing between the two surfaces is the result of a protective arrangement for the respiratory organs of the leaves, which are present on their lower surfaces only.

Also the soft and woolly hairiness that almost conceals the spadices of *Pr. eriophora, Pr. eriostachya,* and *Pr. minor* in their first youth, and of which they despoil themselves later, in part at least, is to be considered as a protective arrangement for their young flowers, against the excessive humidity of the swampy forests of the high mountains of Hawaii.

The appearance of the lower surface of the leaves of *Pritchardia* is shown in the following prospectus:

Pr. pacifica .....Blade green with small elliptical lepidia.
Pr. Thurstonii .....Blade waxy-glaucescent and with small lepidia.
Pr. Maideniana .....Blade waxy-glaucescent and with small lepidia.
Pr. Hillebraudi .....Blade distinctly waxy-glaucescent without lepidia.
Pr. insignis .....Blade distinctly waxy-glaucescent without lepidia.
Pr. remota .....Blade slightly waxy-glaucescent and with rudimentary lepidia.
Pr. affinis (typica) .....Blade green with punctiform lepidia.
Pr. affinis. v. *halophila* .....Blade green with punctiform lepidia.
Pr. affinis v. *rhopalocarpa*....Blade green with punctiform lepidia.
Pr. affinis v. *gracilis* .....Blade green without lepidia.
Pr. lanaiensis .....Blade green with rusty, rather conspicuous punctiform or linear lepidia.
Pr. glabrata .....Blade green with very small lepidia.

[7] Malesia, vol. III, t. XXXVIII, f 13 and 15.

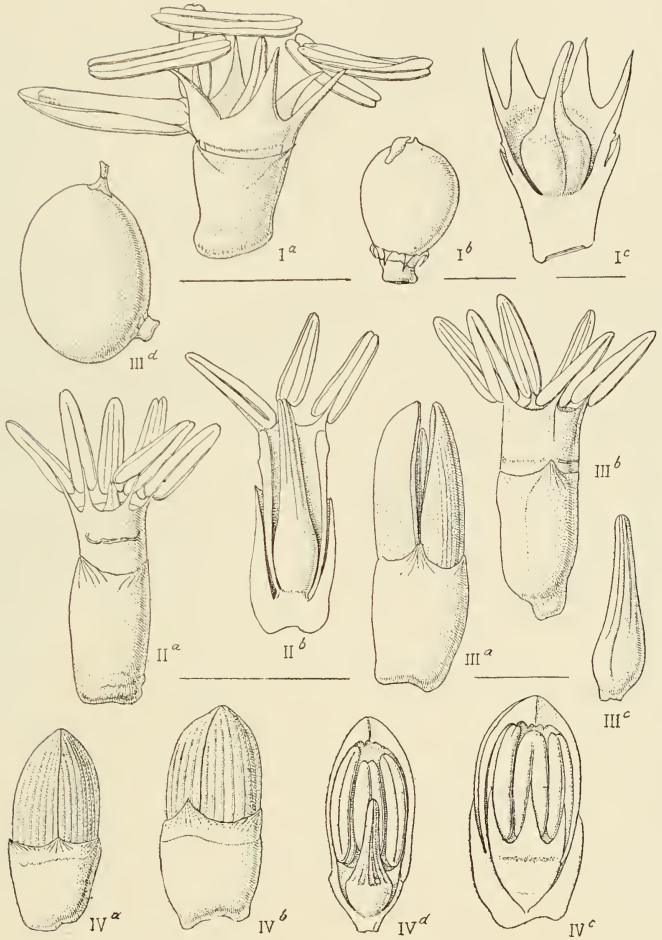

FIGURE 1. DIAGRAMS OF FLOWERS OF PRITCHARDIA: I. Pritchardia Wrightii: (I *a*) Flower during the anthesis—one of the petals still attached to the corolla (enlarged 5 diameters). (I *b*) Young fruit (enlarged). (I *c*) Vertical section of a flower after fertilization (enlarged 5 diameters). II. Pritchardia Beccariana: Flower during the anthesis: (II *a*) entire; (II *b*) vertical section. (Both figures enlarged 5 diameters.) III. Pritchardia Beccariana var. Giffardiana: (III *a*) Flower before expansion; (III *b*) Flower during the anthesis; (III *c*) Ovary (*a*, *b*, *c*, enlarged 5 diameters); (III *d*) Fruit (natural size). IV. Pritchardia remota: *a*, *b*, Flowers before the expansion; *c*, *d*, vertical sections of the same. (All figures enlarged 5 diameters.)

Pr. macrocarpa .....Blade green with minute lepidia.
Pr. Martii .....Blade tomentose from confluent fringed lepidia.
Pr. Gaudichaudii .....Blade rather closely covered with silvery, scalelike, elongate, non-confluent lepidia.
Pr. Lowreyana .....Blade green with punctiform lepidia.
Pr. Beccariana .....Blade green and densely dotted with elliptical, fringed lepidia.
Pr. Rockiana .....Blade subaureous-tomentose.
Pr. arecina .....Blade subaureous-tomentose.
Pr. lanigera .....Blade green and densely dotted with scalelike lepidia.
Pr. eriostachya .....Blade softly scaly-tomentose.
Pr. eriophora .....Blade subaureous-tomentose.
Pr. minor .....Blade subaureous or grayish-tomentose.
Pr. Vuylstekeana .....Blade equally green on both surfaces and without lepidia.
Pr. pericularum .....Blade equally green on both surfaces and without lepidia.
Pr. Wrightii .....Blade thinly tomentose.
Pr. Forbesiana .....Blade equally green on both surfaces, beneath with linear, rusty lepidia.
Pr. brevicalyx .....Blade equally green on both surfaces, sprinkled beneath with minute lepidia.

Distribution of Pritchardia in the Hawaiian Islands.

By Joseph F. Rock.

TABLE OF DISTRIBUTION.

Pritchardia	Nihoa	Kauai	Oahu	Molokai	Maui	Lanai	Hawaii.
arecina					*		
affinis							*
var. gracilis							*
var. halophila							*
var. rhopalocarpa							*
Beccariana							*
var. Giffardiana							*
eriophora		*					
eriostachya							*
Forbesiana					*		
Gaudichaudii				*			
Hardyi		*					
Hillebrandi				*?			
glabrata					*		
Lowreyana				*			
var. turbinata				*			
lanaiensis							
minor		*					
Martii			*				
macrocarpa			*				
remota							
Rockiana			*				
montis-kea							*
lanigera							*
Munroi				*			
kaalae			*				
viscosa		*					
brevicalyx				*			
kahanae			*				
martioides			*				

The distribution of the various species of Pritchardia occurring on the islands of the Hawaiian group from Nihoa to Hawaii proper, is sketched in the following pages.

LAYSAN ISLAND.

A single short-stemmed species of *Pritchardia* has been recorded from Laysan Island and also photographed by zoological collectors, but no specimens were collected, and therefore the identity of that palm cannot be ascertained. It would be very interesting indeed to learn the identity of the Laysan palm, which, according to the photograph examined, is a rather young plant, and must have reached that island through ocean currents. This would prove that *Pritchardia* seeds may be disseminated by ocean currents; that they are immune to the effects of salt water; and that they keep their germinating power for a considerable period. Laysan Island is strictly a coral island of low elevation. The palm found there was recorded as *Pr. Gaudichaudii*, but that is an error as all small fruited species were regarded as belonging to *Pritchardia Gaudichaudii*, and all large fruited species to *Pritchardia Martii* irrespective of the shape of the fruit, size of flowers and leaves and number of panicles in each spadix and whether the latter was glabrous or woolly or tomentose. It is very probable that the species found on Laysan is identical with *Pritchardia remota* Becc., a small fruited species found on Nihoa, a volcanic island, and not far distant from Laysan.

NIHOA OR BIRD ISLAND.

Nihoa is a volcanic island, situated in latitude 23° 05′ 50″ N. and longitude 161° 56′ 30″ W., and is about 400 miles north east of Kauai, considered the oldest island of the Hawaiian group. Little is known of the flora of Nihoa, but all navigators have reported a grove of palms. There are in fact several clumps of palms including about 150 individuals, growing in a sort of valley which extends from sea level to the top of the island which is 880 feet in height. Through the kindness of Captain Brown of the United States Revenue Cutter "Thetis," I secured complete material of the interesting and distinct species, described by Beccari as *Pritchardia remota*. The photograph obtained by Captain Brown is not suitable for reproduction, but it shows that the plants are exposed to the trade winds and gales; that the stems are flexuose and the crown very much ruffled.

Seeds of this species were first brought from Nihoa to Honolulu by a Doctor Rooke in 1858, and a tree grown from seed was planted in the Palace yard, now the grounds of the Executive Building.

KAUAI.

The island of Kauai is circular in outline and is composed of a central mountain mass which culminates in Mt. Waialeale at a height of 5250 feet. The leeward side slopes gently towards the sea and is intersected by deep canyons.

The windward side is precipitous, especially in the Napali region. This region is intersected by deep valleys as Wainiha, Kalihiwai, and in the Napali region by Hanakapiai, Kalalau and other valleys. So far Kauai has produced four species of *Pritchardia* but undoubtedly still others occur in some of the inaccessible mountain fastnesses on the precipitous leeward side. Two species occur on the lee side of the island. *Pritchardia eriophora* Becc. is found on the ridge west of Halemanu, known as Kaunuohua, at an elevation of 4200 feet near the cliffs overlooking Kalalau. (See Pl. XVIII, *A*.) It is a rather tall species 45 feet or more in height and grows in boggy soil associated with species of *Pelea,* as *Pelea anisata, Pelea microcarpa, Tetraplasandra Waimeae, Coreopsis cosmoides, Cheirodendron platyphyllum, Lysimachia glutinosa* and others. It is closely related to *Pritchardia minor* Becc. which occurs also on the leeward side. This is a smaller palm in stature but larger in crown; it occurs near Kaholuamano at an elevation of 3600 feet on steep slopes overlooking Mahana valley in a drier situation than *Pritchardia eriophora.*

In February, 1920, I again visited Kauai for the purpose of photographing palms. During this visit information furnished by natives and others whose business takes them into remote mountainous region, resulted in the discovery of two very distinct and new species. One was found near the so-called Pole Line Trail on Summit Camp at an elevation of 1900 feet. It is described in this paper as *Pritchardia Hardyi* Rock and is one of the tallest species, measuring about 70 feet in height. A few individuals were found. The one here pictured (see Pl. XIII, *A*) grew in a deep ravine; and so only a fourth of the actual trunk is visible in the photograph. This species is related to *Pritchardia minor* and with *Pritchardia eriophora* had a common origin. The fourth species, *Pritchardia viscosa* Rock, was discovered not very far from the Pole Line Trail but on the cliffs in a branch of Kalihiwai Valley at an elevation of about 2000 feet. This species is decidedly distinct and has very little in common with the other three species found on Kauai. It is unique among the Hawaiian species in its very viscous inflorescence. The trunk is not nearly as tall as in *Pritchardia eriophora* or *Pr. Hardyi,* measuring only about 20 feet in height. With the exception of *Pritchardia viscosa,* the other Kauai species are small fruited with elliptical, not spherical, fruits, while *Pritchardia viscosa* has obovate to pyriform large fruits. They are all shiny black when mature.

OAHU.

The island of Oahu which is separated from Kauai by a channel 60 miles wide, is divided into two main mountain ranges. The western one nearest to Kauai, is known as the Waianae range which culminates in Mt. Kaala, the highest point of Oahu, 4030 feet in height. The other range forms the main back bone of the island and is known as the Koolau range with mountains a little over 3000 feet in height. So far, only three species of *Pritchardia* have been found on Oahu. One, *Pritchardia kaalae* (see Pl. VI, *A*), is restricted to the Waianae

mountains, and especially to the left branch of Makaleha Valley, where it is found at about 1800 feet elevation at the foot of the cliffs forming Mt. Kaala. Several individuals form a beautiful grove on a small ridge leading to the cliffs of Kaala. The palms are about 25 feet in height and are remarkable for their exceedingly long inflorescence or spadix which measures over seven feet in length. The fruits are small in size as compared to those of the other two species found on Oahu. *Pritchardia Martii* (Gaud.) H. Wendl. is restricted to the Koolau range, where it occurs near the summit of that range and on the ridges of valleys leading to the crest of it. It extends from Wailupe Valley to Niu, Palolo, Moanalua and Waiahole valleys, where it grows on the steep cliffs. So far it has not been found beyond Waiahole, but in all probability it extends to Kahana. At Kuliouou, the easternmost valley of the Koolau range, on the windward side, and on windswept absolutely barren ridges there occur clumps of palms which may be *Pritchardia Martii,* but owing to the inaccessibility of the vertical, barren cliffs, no specimens were collected. *Pritchardia Rockiana* Becc. is confined to the windward side of the Koolau range and especially to the mountains back of Punaluu and Hauula in the dense rain forest in the western half of the range. It differs from *Pr. Martii* in the large obpyriform fruits and densely tomentose panicles. It is short in stature like *Pritchardia Martii* but the trunk is stouter, light gray and smooth. From Nuuanu Valley, which divides the Koolau range into a western and an eastern part, Dr. W. Hillebrand records a species which he referred erroneously to *Pritchardia Martii.* This species was published by Linden in 1876 as *Pritchardia macrocarpa* (see Pl. XII, *A*). It exists now only as a cultivated species in the older gardens of Honolulu and only five or six individuals are extant. Regarding this species Hillebrand remarks: "In Nuuanu where until a recent time two clumps could be seen from the upper part of the valley, one was completely exterminated when the natives found that the trees were salable to amateurs of gardening in Honolulu; the other owes its preservation to the absolute inaccessibility of the cliff on which it stands." No specimens, however, can be seen now in that valley and *Pritchardia macrocarpa* exists as far as is known now as a cultivated species only. The specimen reproduced here grows in the garden of Mrs. Mary E. Foster on Nuuanu Avenue, the former premises of Dr. W. Hillebrand, who planted two specimens of this species which bear profusely.

MOLOKAI.

The island of Molokai is oblong in outline and is composed of two distinct parts which once were undoubtedly separate islands. The west end nearest to Oahu and separated from that island by a channel twenty miles wide is quite bare and without tree growth, save a few scattered individuals the remnants of a semi-xerophytic forest. There are of course no Pritchardias in that region. The eastern part of the island with its vertical cliffs on the windward side and its deep ravines as Waihanau, Waikolu, Waialeia, Pelekunu, Wailau, and

Halawa, and its even, although steep, slope on the lee side, is the region in which Pritchardias abound. The most common species found on Molokai is *Pritchardia Gaudichaudii* (Mart.) Seem. et Wendl. It occurs not only in practically all the valleys on the windward side but also on the rock islets off the coast of Molokai. It seems to be a variable species which loves the windswept, weather-beaten cliffs, as the accompanying illustration testifies (see Pl. VIII, *A*). It clings to sheer walls where hardly any other vegetation can take hold. I observed it growing in a straight line, one tree above another, along the precipitous walls of a waterfall without the sign of any other tree or even shrub. On the steep walls or cliffs which rise vertically from a deep sea this species abounds, with *Pandanus tectorius* as well as on Haupu and Huela, two spurs jutting out into the sea from the main cliffs. One of the islets off the coast harbors several specimens of this species.

On the ridge dividing Waihanau Valley from Waialeia Valley, *Pritchardia Gaudichaudii* is quite common, but only on the slopes towards the sea, while a little further inland on the flats occurs another and very distinct species, *Pritchardia Lowreyana* Rock. It is a much larger palm but of short stature and has the largest fruits of any species in the genus. These two species had undoubtedly a common origin. A new variety recently discovered by me in the same locality grow in company with *Pritchardia Gaudichaudii* nearer the edge of the cliffs immediately above the sea but at a height of about 3,000 feet. This variety must be referred to *Pritchardia Lowreyana* Rock; it differs from the species in the smaller fruits, which are pointed at both ends, in the smaller stature of the palm, and in the shorter spadices.

The lee side of Molokai, back of Kamolo, is intersected by several ravines which are more or less shallow; the actual slopes are, however, practically barren and covered with loose volcanic rocks up to nearly 2,000 feet elevation. In that region *Dodonaea eriocarpa* is very common and some xerophytic trees as *Dracaena aurea, Xanthoxylum mauiense, Osmanthus sandwicensis, Sideroxylon sandwicense* var. *molokaiense*. At the two thousand-foot level *Dodonaea stenoptera* is very common and especially at Puakoolau and Kamolo proper. The region must be considered a subxerophytic one although a thousand feet higher the rain forest commences. It was in this subxerophytic region that another new *Pritchardia* was discovered. It is herein described as *Pr. Munroi* Rock, in honor of Mr. James Munro to whom I am greatly indebted for many courtesies and hospitality. (See Pl. XIV, *A*.)

The species is exceedingly interesting, as it is one of the few occurring in semi-arid regions. It is a small palm, with very short woolly panicles and perfectly spherical small brown fruits. The costae on the under side of the leaf are covered with large and robust brownish-green scales such as have not been observed in any other species.

Pritchardia brevicalyx, also a newly discovered species, occurs in Wailau

Valley on the windward side of Molokai, where it grows in similar locations as *Pritchardia Gaudichaudii.* It is also cultivated by the natives of Wailau in front of their houses.

MAUI.

The island of Maui is composed of two distinct mountain masses, West Maui and East Maui. It has, so far as is known, only three species of Pritchardia. The eastern part of Maui is made up of the great mountain mass known as Haleakala, one of the largest extinct craters in the world. This mountain, rising to a height of little over 10,000 feet, is younger than the western part of Maui, which is deeply intersected on all sides by ravines and gorges, the highest points being Puu Kukui, nearly 6,000 feet, and Mauna Eeke, over 4,000 feet in height. Two species of *Pritchardia* have been found in this region. The most distinct species found on Maui is *Pritchardia arecina,* which occurs on the windward side at an elevation of about 3,000 feet back of Honomanu and Nahiku in dense rain forests. This species, while very distinct, shows a decided relationship to *Pritchardia lanigera* of the Kohala mountains of Hawaii, separated from East Maui by a channel forty miles wide. The other species, *Pritchardia glabrata* and *Pritchardia Forbesiana,* are restricted to the rain forests of West Maui, the former to the lateral branches of Iao Valley, and the latter to the drainage basin of Honokahau immediately below Mauna Eeke, an open bog of over 4,000 feet elevation (see Pl. IX, *A*). It is interesting to note that *Pritchardia Forbesiana* is very closely related to *Pritchardia Gaudichaudii* so common on Molokai and only a few miles distant from the west end of Maui. Undoubtedly the valleys of Waihee, Honokawai, and Olowalu, of the west end, and the mountains back of Keanae and Kipahulu will furnish additional species, since it has been found that each species is very precinctive indeed, being confined not only to one island but to certain valleys or circumscribed areas.

LANAI.

This comparatively small island harbors at least one distinct species, *Pritchardia Lanaiensis;* but there is a strong suspicion of a second species occurring there, as among the fruits of the above-mentioned species deposited in the B. P. Bishop Museum Herbarium there are some which do not belong to *Pritchardia lanaiensis,* but belong to an entirely different plant. The mature fruits, which I have carefully examined, are different from any known to me and I designated this otherwise incompletely known species as *Pritchardia elliptica* Rock. According to the accompanying note it occurs at the eastern end of that island, while *Pritchardia lanaiensis* grows on the windward side at the head of Mauna Lei gorge and also on the edge of the canyon Nahoku, where I observed a number of individuals.

HAWAII.

The largest and youngest island of the Hawaiian group with three huge mountain masses rising to a height of nearly 14,000 feet and another formidable mountain mass much older than the three volcanoes mentioned, harbors the largest number of species of *Pritchardia.* The Kohala mountains are deeply intersected by numerous ravines on the windward side, while the summit is a flat plateau with a very stunted vegetation and dotted with volcanic cones covered with verdure. It is on this plateau that we find *Pritchardia lanigera* scattered usually as single individuals. It does, however, extend into the dense forests back of Awini on the windward side. So far this is the only species recorded from the Kohala mountains. It was first discovered by Lydgate and was re-collected by me in 1910 above Awini, and recently (March, 1920) on the high plateau back of Waipio Valley at an elevation of 4,000 feet.

Nearest to this locality on the slopes of Mauna Kea facing the Kohala mountains between Mana and Honokaa, I discovered a species allied to *Pritchardia lanigera.* It is a taller species with very large fruits. Unfortunately it is on the verge of being exterminated. Only a few individuals are still extant and they are in a most precarious condition. The forest, their natural environment, has been wholly destroyed, not a vestige of their former associates being left, save a few dead trunks and scattered branches. I discovered this interesting species in 1909 but at the time of my visit none of the three specimens then seen bore either flowers or fruits. I made a special trip to this locality eleven years later and succeeded in locating a single individual which is here photographically reproduced. (See Pl. XVI, *A.*) It is described in this paper for the first time under the name *Pritchardia montis-kea.*

Another very interesting species which occurs as numerous individuals throughout the forests above and below Glenwood between the slopes of Mauna Loa and Mauna Kea at an elevation of about 2,000 feet is *Pritchardia Beccariana,* first discovered by me in 1914. (See Pl. XI, *A.*) It is a very glabrous species, and perhaps the tallest found in these islands. It inhabits the dense rain forests, which are mostly composed of *Metrosideros collina polymorpha,* and towers sometimes above these trees. Its dimensions are huge, young leaves measuring ten feet in diameter. At a somewhat higher elevation, about 3,000 feet, this species is represented by a variety of smaller dimension in every respect, but otherwise not materially different from it. It is described by Doctor Beccari as var. *Giffardiana.* The next locality where the genus is again represented is on the southern slopes of Mauna Loa in the rain forests of Kau above Naalehu at an elevation of 3,000 feet. It was discovered by me in 1912 and described by Beccari as *Pritchardia eriostachya.* It is related to *Pritchardia montis-kea* and *Pritchardia lanigera* but differs from both in many respects.

In South Kona, also on the southern slopes of Mauna Loa but in the drier belt where rain is much less frequent than at Glenwood and in the Naalehu

forest, there occur apparently two species and three varieties of one. There is no question that South Kona is the home of *Pritchardia affinis,* also a newly described species, hitherto confused with *Pritchardia Gaudichaudii.* Tall specimens seventy-five feet in height occur at Kaohe and Opihale and also at Kealia. (See Pl. III, *A.*) The original forest surrounding this species has practically disappeared with the exception of a few tree ferns and a few Metrosideros trees.

The palms were saved from the ax on account of their usefulness, the natives employing the young leaves in the making of hats, and the young seeds though not particularly palatable are eagerly sought by them. Several varieties of *Pritchardia affinis* are found on Hawaii, var. *rhopalocarpa* at Kealakekua (see Pl. IV, *B*), var. *halophila* at Kalapana, and var. *gracilis* at Kiholo in North Kona.

The Uses of Pritchardia.

By Joseph F. Rock.

The Hawaiians have evidently always employed the leaves of the species of *Pritchardia* occurring in Hawaii. But probably only since the arrival of the white man in these islands have they learned the braiding of the young leaves into hats. The natives have two names for Hawaiian Pritchardias, *Loulu lelo* and *Loulu hiwa,* and consequently only two species are recognized by them. Hillebrand states that *Loulu lelo* is the palm found on the northern coast of Molokai and this would indicate that it is *Pritchardia Gaudichaudii,* while *Loulu hiwa* is in all probability *Pritchardia Hillebrandi.* The young leaves of this latter palm are especially preferred by the Hawaiians for the making of hats, as they are of a bluish white and have no scale-like lepidia of any sort on their undersurfaces, but are covered with a glaucous waxy-powdery substance. It is the most commonly cultivated species, although *Pritchardia affinis* is also very often met with near Hawaiian dwellings.

The seeds of all the species are used by the natives for food, but only in an immature state, the kernel having somewhat the taste of coconut. The seeds are known to the Hawaiians as *Hawane* and also *Wahane.* The latter name recurs at the Marquesas Islands as the name of *Pritchardia pacifica,* which is said to occur there. Owing to the seeds being much sought by natives and children, while still immature, it is often very difficult to find ripe fruits, and even in the mountains mature seeds are very scarce owing to rats and mongooses which eat the fruits as soon as they have fallen. The trees are also often mutilated by the natives and deprived of their leaves with the exception of one or two at the apex of the trunk. There is no doubt that some of the species are on the verge of extinction, as for example *Pritchardia montis-kea* and others. Of many of the species not a single young plant could be found beneath them. If seeds do escape the ravages of rats, the young plants resulting are dug up and eagerly devoured by wild pigs. Insects have been found to attack the young fruits of

Pritchardia Beccariana and it is difficult indeed to find young plants. Mature plants of this latter species abound near Glenwood and at Hale loulu on Hawaii, which fact, however, does not warrant the cutting down of these beautiful objects in order to build fences with their trunks. Such practice should be forbidden.

PART II.—SYSTEMATIC TREATMENT.

By Odoardo Beccari and Joseph F. Rock.

The Genus Pritchardia.

Pritchardia Seem. et H. Wendl. in Bonpl. IX, 260; X, 197, 310, t. 15; Benth. et Hook. Gen. Pl. III, 928; Becc. Malesia, III, 286, t. XXXVII, XXXVIII, and in Webbia, II (1907), 200, and III (1910), 137, and IV (1913), 202, f. 12-17; Rock, Indig. Trees Haw. Isls. (1913), 99-107, pl. 32-33; Blatter, Palms Brit. Ind. in Journ. Bomb. Nat. Hist. Soc., March 31, 1912, 357, pl. XXIX; Baill. Hist. des Pl. XIII, 319 (in part).

Pritchardia Colpothrinax Gris. et Wendl, in Bot. Zeit. 1897, 147; Benth. et Hook. Gen. Pl. III, 927; Drude in Engl. et Pr. Pflanzenf. II, 3 (1889), 33; Baill. Hist. des Pl. XIII, 315.

Pritchardia Washingtonia sp. O. Kuntze Rev. Gen. Pl. II (1891), 737.

Pritchardia eupritchardia O. Kuntze Rev. Gen. Pl. III, 2 (1898), 323.

Arboreous unarmed palms with solitary, naked, ringed stems. *Leaves* terminal, large, the old ones deciduous; the blade flabellate, expanded in outline for a more or less extensive portion of a circle, usually broadly cuneate at the base, undivided in the central part, and more or less deeply multifid on the periphery; the segments more or less deeply bifid, usually, with interposed filaments; the upper face of the blade is devoid of stomata. Petioles always unarmed, ligulate at apex anticously, and passing behind without interruption into a short rachis. The majority of the mid-costas of the segments start from the apex of the petioles, but some also from the sides of the rachis. *Spadices* interfoliaceous, composed of one panicle only, more or less, branched, or, at times, of 2-4 distinct similar panicles, each of which is borne on the end of a distinct peduncular part; *spathes* several, coriaceous, the lower sheaths the peduncular part, and the upper ones (2 or more in number) are concave, lanceolate, boat-shaped, or ass's-ear-like, and embrace the flowering panicle. *Flowers* hermaphrodite, scattered, or else spirally arranged on the branchlets and solitary (never glomerulate) and sessile on bracteate pulvinuli; special floral bracteolae none. *Calyx* tubular or cyathiform-companulate, more or less solid in its lower portion; the limb slightly 3-toothed. Corolla considerably longer than the calyx; it has a permanent tube, and three valvate divisions, the latter deciduous at the time of anthesis. Stamens 6; the filaments with their united bases form at the faux of the corolla, a ring, crowned by six filamentose subulate apices; anthers linear, or linear-oblong, or linea-sagittate, dorsifix, at first erect, versatile during anthesis, dehiscing internally. Ovary conical, ovate, obovate, or else turbinate; composed of three half free, uniovulate carpels; the latter deeply sculptured above,

and united into an elongate trigonous style, which has a nearly common punctiform stigma. Ovules solitary in the carpels, basilar, erect, anatrope. *Fruit* always produced from the development of one carpel only, globular or ovoid, regular, or very slightly asymmetrical at the base, and having the remnants of the sterile carpels and the style at apex. The whole pericarp is generally not very thick; the epicarp has a smooth surface; the mesoscarp is slightly fleshy or grumous, or else more or less traversed by longitudinal fibres; endocarp woody, equally thin all around, but frequently thickened at the base, sometimes easily separating from the mesoscarp at complete maturity. *Seed* globular, erect, and free in the endocarpel cavity; hilum basilar raphe obscure or slightly impressed, occupying a whole side of the seed, with very few faint, or wholly obsolete vascular branches; the integument slightly more thickened on the raphe side than elsewhere, but not penetrating into the substance of the albumen; albumen homogeneous; embryo basilar, placed near the hilum, or else shifted toward the middle of the antiraphe side.

Fruiting perianth persistent, hardened, not, or very slightly, accrescent, more or less pedicelliform.

Conspectus of the Species.[8]

I. Flowers exsuccous or coriaceous. (Polynesian species.)

A. Floriferous branchlets glabrous.

a. Fruit globous, small (7 to 14 mm. in diameter).

b. Leaf-blade green underneath and dotted there with small elliptical, superficial lepidia. Spadices shorter than the leaves. Unopened flowers 7 to 7.5 mm. long. Fruit 12 mm. in diameter; pericarp 1.3 mm. thick . . . . . 1. Pritchardia pacifica Seem. et Wendl.—Fiji.

b.[1] Flowers smaller than in the type. Fruit with a thicker pericarp . . . . . Pr. pacifica var. samoensis Becc., cultivated in Samoa.

b.[2] Leaf-blade waxy-glaucescent beneath, and dotted there with small elliptical lepidia, which nest in depressions of the epidermis. Spadices longer than the leaves. Unopened flowers 5 to 5.5 mm. long. Fruit 7 mm. in diameter . . . . . 2. Pritchardia Thurstonii F. Muell. et Drude.—Fiji.

b.[3] Leaf-blade very obsoletely waxy-glaucescent beneath and dotted there not closely with small elliptical, brown lepidia. Unopened flowers 10 to 11 mm. long; the calyx 3 mm. long; the corolla three times as long as the calyx. Floriferous branchlets relatively thick (4 to 5 mm. in diameter). Fruit 12 to 14 mm. in diameter . . . . . 3. Pritchardia Maideniana Becc. The precise locality unknown. Probably from some of the lower Polynesian Islands.

[8] This conspectus was arranged by Doctor Beccari; Professor Rock is, however, responsible for the keys to the following species: No. 11, *Pr. kaalae;* No. 14, *Pro. Forbesiana;* No. 19, *Pr. Hardyi;* No. 20, *Pr. Munroi;* No. 22, *Pr. montis-kea;* and No. 23, *Pr. viscosa.*

a.[1] Fruit mediocre, 18 to 23 mm. in diameter; spherical or nearly so, (not exactly known of PRITCHARDIA GLABRATA).

b. Leaf-blade more or less powdery waxy or glaucescent beneath.

c. Leaf-blade distinctly waxy-pulverulent and devoid of lepidia beneath. Panicle having the lower branches digitately 3 to 4-partite. Floriferous branchlets rather slender. Calyx of a hard nearly woody structure, especially at the base, very faintly veined in its upper part only; petals very faintly striate outside. Fruit globose, usually slightly longer than broad (18 to 20 by 17 to 19 mm.). Fruiting perianth conspicuously pedicelliform, cylindrical, 4 mm. long and high . . . . . 4. PRITCHARDIA HILLEBRANDI Becc.—Hawaiian Islands.

c.[1] Leaf-blade slightly powdery-waxy and devoid of lepidia beneath. Panicle composed of few simple or slightly divided, thickish (4 to 5 mm. through), polished, floriferous branchlets. Calyx not veined, of a hard texture. Fruit spherical, 14 to 16 mm. in diameter. Fruiting perianth pedicelliform, subcampanulate . . . . . 5. PRITCHARDIA INSIGNIS Becc.—The precise locality unknown. Possibly from some of the Hawaiian Islands.

c.[2] Leaf-blade slightly powdery-waxy and dotted with small, almost rudimentary, lepidia beneath. Panicle elongate, much branched, the lower branches divided into 10 to 12 slender floriferous branchlets. Petals conspicuously pluri-costulate. Fruit nearly spherical, 19 to 20 mm. long, 18 to 19 mm. in diameter. Fruiting perianth 4 mm. high, ventricose-pedicelliform . . . . . 6. PRITCHARDIA REMOTA Becc.—Nihoa or Bird Island (Hawaiian Islands).

(not powdery-waxy).

b.[1] Leaf-blade green on both surfaces or only paler beneath than above

c. A tall plant. Leaf-blade rather closely dotted beneath with small, orbicular, or oblong lepidia. Calyx nearly smooth, of a hard texture and nearly woody at the base. Fruit spherical or a trifle narrowed to the base, 23 mm. in diameter. Fruiting perianth pedicelliform, cylindrical or slightly campanulate . . . . . 7. PRITCHARDIA AFFINIS Becc. (forma typica).—Hawaii.

c.[1] A smaller plant than the type. Leaf-blade dotted with minute, spaced lepidia. Fruit spherical 20 to 21 mm. in diameter . . . . . PR. AFFINIS var. HALOPHILA Becc.—Hawaii

c.[2] Leaf-blade sparingly dotted on the lower surface with very small lepidia. The ripe fruit subspherical, the immature one obovate, distinctly narrowed to the base, 25 mm. long, 20 to 22 mm. in diameter . . . . . PR. AFFINIS var. RHOPALOCARPA Becc.—Hawaii.

c.[3] Rather small, 3 to 4 mm. high. Leaf-blade devoid of lepidia. Fruit obovate, distinctly narrowed to the base, 20 to 22 mm. long, 16 to 17 mm. in diameter . . . PR. AFFINIS var. GRACILIS Becc.—Hawaii.

c.[4] Leaf-blade spotted beneath with punctiform, or else very narrowly linear, rusty lepidia. Floriferous branchlets slender bearing nearly regularly bifarious flowers; calyx campanulate, fleshly-coriaceous, conspicuously veined. Fruit spherical, 2 cm. in diameter. Fruiting perianth nearly explanate (not pedicelliform) . . . . . .

8. PRITCHARDIA LANAIENSIS Becc. et Rock.—Lanai (Hawaiian Islands).

c.[5] Small. Leaf-blade quite glabrous, yet dotted beneath with small, orbicular, not fringed lepidia. Floriferous branchlets slender. Unopened flowers acuminate; calyx campanulate, fleshy-coraceous, sharply veined. Fruit perhaps smaller than that of the other species of the group, ovoid when young. Fruiting perianth somewhat depressed, with the callous remains of the corolla tube spreading . . . . . .

9. PRITCHARDIA GLABRATA Becc. et Rock—Maui (Hawaiian Islands).

a.[2] Fruit relatively large, 3 cm. or more long.

b. Leaf-blade green and dotted beneath with very minute, orbicular or elliptical, pale, not fringed lepidia. Fruiting perianth depressedly pedicelliform, with the remains of the corolla tube and saminal ring inconspicuous. Fruit obovate, narrowed to the base, 4 to 4.5 cm. long, 3 to 3.5 cm. in diameter. Short stemmed . . . . . .

10. PRITCHARDIA MACROCARPA Linden—Oahu (Hawaiian Islands).

b.[1] Leaf-blade large, dark green on both sides, dotted beneath rather closely with elliptical, slightly fringed, pale lepidia. Spadix 2.5 m. long, twice branching. Fruit 3 cm. long, 2 cm. thick, pear-shaped. Tall stemmed . . . 11. PRITCHARDIA KAALAE Rock—Oahu (Hawaiian Islands).

b.[2] Leaf-blade clothed beneath with an appressed tomentum composed of irregular, conspicuously fringed, confluent lepidia. Fruit not thoroughly mature(?), regularly elliptical, narrowed at both ends, but especially above, and pointed, about 4 cm. long, and 28 mm. in diameter. Fruiting perianth with a depressed, callous, shortly pedicelliform base, and the remains of the corolla tube and staminal ring split into several conspicuous pieces and spreading . . . . . 12. PRITCHARDIA MARTII (Gaud.) H. Wendl.—Oahu (Hawaiian Islands).

b.[3] Leaf-blade furnished beneath with rather closely but not confluent, relatively large, scale-like, silvery, elongate, slightly fringed lepidia. Fruit regularly spherical. A short stemmed palm . . . . . 13. PRITCHARDIA GAUDICHAUDII H. Wendl.—Molokai (Hawaiian Is.)

b.[4] Leaf-blade dotted beneath with elliptical, scale-like subentire yellowish lepidia. Spathes densely covered outside with a detachable brown wool. Flowers small, calyx subtruncate. Fruit ovoid to subglobose 4 to 4.5 cm. long, 3.2 to 3.5 cm. thick . . . . . 14. PRITCHARDIA FORBESIANA Rock—Maui (Hawaiian Islands).

b.[5] Leaf-blade green on both surfaces, dotted beneath with minute, punctiform, not fringed lepidia. Fruit large regularly ovoid, rounded at the base and conically pointed, 6 cm. long, 4 cm. through. A short stemmed palm . . . . . .

15. Pritchardia Lowreyana Rock—Molokai (Hawaiian Islands).

b.[6] A smaller plant than the type, fruits smaller 4.5 to 5 cm. long, nearly 3 cm. through, pointed at both ends . . . . . .

Pr. Lowreyana var. turbinata Rock—Molokai (Hawaiian Islands).

b.[7] Leaf-blade darker green beneath dotted with numerous narrow-elongate opaque, sulphur-yellow, thick, non-fringed lepidia. Flowers large, the calyx very short, petals excluded from the calyx. Fruit obovate, 4.5 cm. long, 3.2 cm. in diameter . . . . . .

16. Pritchardia brevicalyx Becc. et Rock—Molokai (Hawaiian Is.)

b.[8] Leaf-blade green and rather densely dotted beneath with small elliptical lepidia, the latter having hyaline fringed margins. Flowers 12 to 13 mm. long. Fruit globose-oblong, somewhat asymmetrical at the base, 3-3.5 cm. long, 2.5 to 3 cm. through. A tall palm . . . . . .

17. Pritchardia Beccariana Rock—Hawaii (Hawaiian Islands).

b.[9] A smaller plant than the type. Flowers slightly smaller . . . . . .

Pr. Beccariana var. Giffardiana Becc. Hawaii

A.[1] Floriferous branchlets thinly but permanently, rusty-tomentose. Leaf-blade subaureous tomentose beneath.

a. Fruit large obpyriform, 5 cm. long, 3 cm. in diameter. Panicle large spreading with subhorizontal thick branches . . . . . .

18. Pritchardia Rockiana Becc.—Oahu (Hawaiian Islands).

a.[1] Fruit small obovoid, 2 cm. long, 16 mm. in diameter. Panicles with erect, simple, slender branches . . . . . .

19. Pritchardia Hardyi Rock—Kauai (Hawaiian Islands).

A.[2] Floriferous branchlets densely and permanently villose.

a. Fruits small, globose 22 mm. long, 20 mm. in diameter. Spadix short, twice-branched, panicle 12 cm. Leaf-blade dotted beneath with small, elongate, entire, hyaline lepidia . . . . . .

20. Pritchardia Munroi Rock—Molokai (Hawaiian Islands)

a.[1] Fruits larger, 3.5 to 4.5 to 5.5 cm. long.

b. Calyx hairy-subtomentose.

c. Leaf-blade subaureous-tomentose beneath. Unopened flowers 12 to 14 mm. long. Fruit large, slightly irregularly globose, a little longer than broad (4.5 cm. long, and nearly 4 cm. in diameter) . . . . .

21. Pritchardia arecina Becc.—Maui (Hawaiian Islands).

c.[1] Leaf-blade green beneath but with few scattered, long-elliptical, hyaline lepidia. Fruit 5.5 cm. long, 4 cm. in diameter, obovoid, panicles with thick, horizontal, woolly branches . . . . . .

. 22. PRITCHARDIA ARECINA Becc.—Maui (Hawaiian Islands).

b.[1] Calyx and corolla thickly viscous as if varnished. Leaf-blade densely tomentose with appressed confluent fringed lepidia. Fruit elliptical-pyriform, 4 cm. long, 2.5 cm. in diameter . . . . 23. PRITCHARDIA VISCOSA Rock—Kauai (Hawaiian Islands).

b.[2] Calyx glabrous.

c. Leaf-blade closely dotted beneath with small appressed, scale-like, orbicular or oblong lepidia. Petioles and spathes clothed with a copious floccose greyish, amianth-like more or less permanent tomentum. Fruit apparently ovoid and rather large (not known at perfect maturity) . . . . . 24. PRITCHARDIA LANIGERA Becc.—Hawaii (Hawaiian Islands).

c.[1] Leaf-blade softly scaly-tomentose beneath. Peduncular part of the spadix and spathes clothed with a copious, soft rufous woolliness. Fruit ovoid-ellipsoidal or slightly obovoid, 3.5 to 4 cm. long (including the pedicelliform perianth) and 26 to 28 mm. in diameter . . . . . 25. PRITCHARDIA ERIOSTACHIYA Becc.—Hawaii (Hawaiian Is.)

B. Floriferous branchlets clothed with a dense floccose detachable woolliness.

a. Leaf-blade tomentose-subareous beneath. Floriferous branchlets short (2.5 cm. long) bearing rather distant, spirally alternate flowers. Fruit elliptical-subfusiform, conical above and acute at the base, 2.5 to 3 cm. long, 12 to 13 mm. in diameter . . . . . 26. PRITCHARDIA ERIOPHORA Becc.—Kauai (Hawaiian Islands).

a.[1] Leaf-blade greyish or subaureous and softly tomentose beneath. Floriferous branchlets 4 to 7 cm. long with spirally, rather closely set flowers Fruit small, ovoid-ellipsoidal or subobovoid, rounded above and narrowed to the base, 18 to 20 mm. long, 12 to 13 mm. in diameter . . . . . 27. PRITCHARDIA MINOR Becc.—Kauai (Hawaiian Islands)

Of the two following species only the fruits and the young leaves of cultivated species are known.

A. Fruit oblong, 24 mm. long, 18 mm. in diameter. Seed 15 mm. long, 14 mm. thick. Leaf-blade green on both surfaces, devoid of lepidia . . . . . 28. PRITCHARDIA VUYLSTEKEANA H. Wendl. Paumotu Islands.

B. Fruit nearly spherical, 20 mm. long, 18 mm. in diameter . Seed 14 mm. long, 13 mm. thick. Leaf-blade as in the preceding . . . . . 29. PRITCHARDIA PERICULARUM H. Wendl. Paumotu Islands.

II. Flowers fleshy—(Neogeous).

A tall palm with a stem swollen and bottle-shaped in its lower part, and slender

above. Leaf-blade, thinly tomentose beneath. Fruit globose, 15 to 18 mm. in diameter . . . . . .

. . . . . .

30 PRITCHARDIA WRIGHTII (Gris. et Wendl.) Becc.—Cuba and Isla de Pinos.

31. PRITCHARDIA AUREA Hort. Linden—Known only as a cultivated plant and in a sterile condition. Doubtful species.

SYNONYMS, DOUBTFUL AND EXCLUDED SPECIES.

PRITCHARDIA AUREA Hort. Lind.; Revue Hort. 1878, 186, Quid? Patria?

. . . . *borneensis* Hort. Lind. ex Gard. Chron. 18th March 1893, 332 (name only). (A species of *Licuala?*)

. . . . *Cusiniana* Hort. Lind. ex Pfister, Sabaleenbl. 31=*Livistonae* sp.

. . . . *filamentosa* H. Wendl. in Bot. Zeit. XXXIV (1876) 807=*Washingingtonia filifera* H. Wendl.

. . . . *filifera* Linden ex André in Illust. Hort. XXIV (1877) 32. 105=*Washingtonia filifera* H. Wendl.

. . . . *grandis* Hort. Bull. ex Gardn. Chron. 1874, I, 415; Revue Hort. 1884, 28=*Licuala grandis* H. Wendl.

. . . . *grandis* Hort. Veitch.=*Licuala orbicularis* Becc. (*L. Veitchii* W. Watson in Gardn. Chr. 1886, Jan. 139).

. . . . *Moensii* Hort.; Revue Hort. 1883, 206 (name only) Becc. Malesia, III, 300 (Said to be a native of Paumotu. To be compared with *P. Vouylstekeana* or *P. pericularum*).

. . . . *nobilis* Hort.; Revue Hort. 1881, 384; Revue de l'Hort. Belge, 1882, 12. Quid?

. . . . *robusta* Hort.=*Washingtonia robusta* H. Wendl.

COLPOTHRINAX WRIGHTII Gris. et Wendl. in Pl. Cub. Wrigh. No. 3964=*Pritchardia Wrightii* Becc.

EUPRITCHARDIA GAUDICHAUDII O. Kuntze, Rev. Gen. Pl. III, 2. (1898) 323=*Pritchardia Gaudichaudii* H. Wendl.

. . . . *Hillebrandi* O. Kuntze, Rev. Gen. Pl. III, 2. (1898) 323=*Pritchardia Hillebrandi* Becc.

. . . . *lanigera* O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323=*Pritchardia lanigera* Becc.

. . . . *Martii* O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323=*Pritchardia Martii* H. Wendl.

. . . . *pacifica* O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323=*Pritchardia pacifica* Seem. et H. Wendl.

. . . . *remota* O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323=*Pritchardia remota* Becc.

. . . . *Thurstonii* O. Kuntze, Rev. Gen. Pl. III, 3 (1898) 737=*Pritchardia Thurstonii* F. Muell. et Drude.

Washingtonia Hillebrandi O. Kuntze, Rev. Gen. Pl. II (1891) 737=*Pritchardia Hillebrandi* Becc.

. . . . *Gaudichaudii* O. Kuntze, Rev. Gen. Pl. II (1891) 737=*Pritchardia Gaudichaudii* H. Wendl.

. . . . *lanigera* O. Kuntze, Rev. Gen. Pl. II (1891) 737=*Pritchardia lanigera* Becc.

. . . . *Martii* O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323=*Pritchardia Martii* H. Wendl.

. . . . *pacifica* O. Kuntze, Rev. Gen. Pl. II (1891) 737=*Pritchardia pacifica* Seem. et H. Wendl.

. . . . *remota* O. Kuntze, Rev. Gen. Pl. II (1891) 737=*Pritchardia remota* Becc.

. . . . *Thurstonii* O. Kuntze, Rev. Gen. Pl. II (1891) 737=*Pritchardia Thurstonii* F. Muell. et Drude.

Detailed Description of Species.

1. **PRITCHARDIA PACIFICA** Seem. et H. Wendl. in Bonpl. IX (1861) 260 and X (1862), pp. 197, 310, t. 15; Seem. Fl. Vit. 274, t. LXXIX and in Viti, An Account, etc., 368; Kerchore, Les Palm. 331, t. XXVII; Rev. Hort. 1873, 320—1874, 65—1875, 35; Illustr. Hort. 1874, 27, t. 161—1881, 32; Belgique Hort. 1875, 62—1878, 114; Fl. des Serres et Jard. 1877, t. 2262; Becc. Malesia, III, 290, t. XXXVII, f. 13-15, and in Webbia, II (1907) 202, and IV (1913) 206, and 210; Drake del Cast. Ill. Fl. Ins. Pac. VII, 323; Blatter, Palms Brit. Ind. in Journ. Bomb. Nat. Hist. Soc., March 31, 1912, 358, pl. XXIX.

Corypha umbraculifera (non Linn.) Forst. Pl. escul. 49 et Prodr. 88 (in part) ex Seem. l. c.

Washingtonia pacifica O. Kuntze, Rev. Gen. Plant. II (1891) 737.

Eupritchardia pacifica O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323.

(Plate XXIV, *IV*)

Description.—A fine rather large Palm. *Stem* 7-10 m. high, straight and about 30 cm. in diam. *Leaves* glabrous, or nearly so in every part (at least when fully developed); the blade one-third of a circle in outline, broadly cuneate at the base, and with a large central entire part; the median segments relatively short in the free part, about 30 cm. long and 4-4.5 cm. broad at the disjunction places, cleft at apex, to the extent of about 10 cm. into two very acuminate non-drooping points; the dry blade has a tough structure, is concolorous and dull on both surfaces; the lower surface is completely devoid of lepidia; transverse veinlets very minute and approximate; the dorsum of the costae is glabrous; petiole about as long as the blade (1-1.20 m. long), spreading-arched. *Spadices* shorter than the petioles, whole about 50 cm. long, composed of an ovate, rather dense, 20-25 cm. long panicle, carried upon an about as long or a little longer, terete, pubescent, peduncular part; the latter as thick as a man's little finger; the panicle is glabrous in every part, has the lower branches, 4-6-partite, and is simply branched above; floriferous branchlets slender, rigid, terete, 8-10 cm. long, about 2 mm. through at the base. Spathes not much shorter than the whole spadix, finely tomentose outside, tubular in their lower part, and dilated above, into a lanceolate acuminate blade. *Flowers* spirally inserted around the branchlets, each furnished with a very slender, capillary, bracteole, lanceolate before expansion, 7.5-8 mm. long, 3.5 mm. through; calyx, cyathiform-campanulate, somewhat contracted at the base (when dry), very obscurely veined, shortly 3-toothed; the staminal ring at the time of the anthesis protrudes considerably above the calyx; filaments subulate, spreading; anthers, sagittate-oblong slightly emarginate at apex; segments of the corolla, elongate-triangular, blunt, truncate at the base, finely striate outside; ovary turbinate, truncate and deeply sculptured above; style, trigonous, sulcate; segments of the corolla elongate-triangular, blunt, truncate at the base, finely striate outside. *Fruit* spherical, 11-12 mm. in diam., slightly excentrically terminated by the rather conspicuous remains of the abortive carpels and style; pericarp, 1.3 mm. thick. *Seed* spherical, 7 mm. in diam., the surface smooth, blackish. *Fruiting perianth* conspicuous, distinctly pedicelliform, terete, 4 mm. long, 3.5 mm. through.

Habitat.—The species of *Pritchardia* occurring in the Fiji Islands at Vanua Levu and at Viti Levu (Seemann No. 659 in the Herbarium at Kew—type specimen) must be considered the true *Pr. pacifica.* Native names "Viu," "Sakiki," or "Niu Masei." It is reported, however, to grow also in the Samoan Islands and in Eua, one of the islands of the Tonga or Friendly group.

The Samoan *Pritchardia* I have hitherto considered as representing a distinct variety of *Pr. pacifica,* but it is apparently a plant introduced into those Islands.

Of the *Pritchardia* from the Tonga Islands I have seen no specimens.

J. J. Lister in Hemsley on the "Flora of the Tonga and Friendly Islands" (Journ. Linn. Soc. Botany, vol. XXX, 1893, p. 162) says that in Eua, along the eastern shore, the "Piu" or "Biu Palms" (*Pritchardia pacifica*) with their great fan leaves, are very handsome objects. The trees are generally very high, running to about 60 to 80 feet (18 to 24 m.). In the same paper are mentioned also the Marquesas Islands as another locality for *Pr. pacifica,* a statement which I greatly doubt, considering the precinctivity of the different species of *Pritchardia.*

A *Pritchardia* from the Tonga Islands is mentioned also by J. H. Burkill in "The Flora of Vavau, One of the Tonga Islands" (Journ. Linn. Soc. Botany, vol. XXXV, 1901, p. 57) and is referred also to *Pr. pacifica.*

Observations.—I am indebted to Professor J. F. Rock for complete specimens of this palm derived from plants cultivated at Honolulu in the Hawaiian Islands; which specimens, as far as the flowers and fruits are concerned, correspond exactly to Seemann's No. 659 of the Kew Herbarium. The portion of the leaf which accompanies the flowers and fruits of Rock's specimen, shows no lepidia on the lower surface; whereas the leaf that I have described in Webbia IV (1913) 210 as that of *Pr. pacifica* had rather numerous elliptical appressed lepidia; but that leaf was from a plant cultivated at Herrenhausen, and there is no absolute certainty of its belonging to the true Fijian *Pritchardia pacifica.* It is possible, however, that the nature and quantity of the leaf-trichomes may vary according to the different conditions of environment and culture. I consider therefore as one of the main characteristics of *Pr. pacifica,* the quite glabrous leaf-blade, even on the dorsum of the main costae, and the absence of the lepidia on its lower surface. *Pr. pacifica* is also characterized by the spadices being shorter than the petioles, by the slender floriferous branchlets and by the small round fruit, and small fruiting perianth.

Pritchardia Pacifica var. **Samoensis** Becc. in Webbia IV (1913), 206 and 212.

Description.—Flowers smaller than in the Fijian plant; the fruit of the same dimensions but with a thicker pericarp.

Habitat.—The Samoan Islands (S. Powell in the Kew Herbarium) According to Rechinger (Botan. u. zool. Ergebnisse einer Wiss. Forschungsreise

n. den Samoa-Ins. etc. III, p. 63) no *Pritchardia* is found growing wild in Samoa and the specimens preserved in the Kew Herbarium must have been obtained from a cultivated plant.

2. **PRITCHARDIA THURSTONII** F. Muell. et Drude in Gartenflora, Sept. 1887, 486, ff. 123, 124, and in Garden Chr. Sept. 1887, 341; Becc. Malesia, III, 290, t. XXXVII, f. 1-12.

Washingtonia Thurstonii O. Kuntze, Rev. Gen. Pl. II (1891) 737.

Eupritchardia Thurstonii O. Kuntze, Rev. Gen. Pl. III (1898) 323.

Description.—A smaller plant than *Pr. pacifica*. *Stem* apparently 4-5 m high, and about 15 cm. in diam. *Leaves,* glabrous in every part, at least when fully developed; blade one-third of a circle in outline, flabellate with a broadly cuneate base, parted to somewhat above the middle into numerous segments; thinly coriaceous, nearly glaucescent underneath from a very thin waxy coating, and also sprinkled with small elliptical lepidia, which nestle into small depressions of the epidermis; transverse veinlets immersed in the parenchyma and little visible; central segments 50 cm. long in the free part, and 4-4.5 cm. broad at the places of disjunction, from thence gradually acuminating to shortly bifid apices; the lower costæ are furnished with a few hyaline scales and are otherwise glabrous. Petioles apparently little shorter than the blade, 4 cm. broad at apex. *Spadices* several, springing from the crown, arched-nodding, longer than the leaves and up to 2 m. in length; they consist of a rather dense, relatively short ovate panicle, supported on a very long peduncular part, which is sheathed by several, very elongate spathes; rachis of the spadix terete, 8-12 mm. in diam. throughout; panicle about 30 cm. long, twice branched in its lower part (the lower and intermediate branches being 2-3-furcate) and simply branched above; floriferous branchlets slender, 10-15 cm. long, 2 mm. through, and minutely wrinkled when dry, though apparently rather fleshy when fresh. *Flowers* rather closely spirally arranged around the branchlets, each furnished with a minute bracteole, when full grown just before expansion, oblong, 6-7 mm. long; calyx cupular-campanulate, shortly 3-toothed; staminal ring (at the time of the anthesis) shortly protruding beyond the calyx; filaments subulate; anthers linear-oblong; corolla about twice as long as the calyx, its segments semiovate, 7-costulate; ovary depressed-turbinate, truncate, and strongly sculptured above; style subtrigonous, sulcate. *Fruit* globose, 7 mm. in diam., terminated, slightly excentrically, by the rather conspicuous remains of the abortive carpels and elongate style; the whole pericarp is not quite one millimeter thick. *Seed* spherical, 4 mm. in diam. *Fruiting perianth* pedicelliform, slightly campanulate, 3 mm. long and equally broad.

Habitat.—Discovered in the year 1886 by the late Hon. J. B. Thurston in one of the more eastern islands of the Fiji group.

Observations.—It is easily distinguishable from *Pr. pacifica* by its smaller dimensions; by the smaller flowers and fruits; by the slender spadices longer than the leaves. I have completed the description of this species given by me in Malesia (l. c.) availing myself of a good specimen preserved in the Berlin Herbarium, derived from a plant cultivated in the Demerara Botanic Garden in

British Guyana. From that specimen the leaves appear considerably different from those of *Pr. pacifica*, having longer, shortly bifid, drooping segments, and the lower surface slightly glaucous-waxy and sprinkled with minute lepidia; the latter nestling in small depressions of the epidermis.

3. **PRITCHARDIA MAIDENIANA** Becc. in Webbia, IV (1913) 213, f. 12.

Description.—Apparently of middling size. *Leaf blade* rigid, coriaceous, 90 cm. long from the ligula to apex, parted to past the middle into numerous segments; lower costæ, very densely tomentose; lower surface very slightly glaucescent-waxy and sprinkled with minute punctiform or oblong lepidia, which nestle into small depressions of the epidermis; transverse veinlets obsolete, being immersed in the parenchyma; central segments about 50 cm. long in the free part, and 4 cm. broad at their places of disjunction, deeply parted into two rigid, very gradually acuminate points. Petiole 4 cm. broad at apex, densely tomentose on the lower surface. *Spadices* glabrous in every part, very rigid, apparently considerably shorter than the leaves; spathes fugaceously cottony, finally glabrous, chartaceous; panicle broadly ovate, 20-23 cm. long, very rigid, composed of not many spreading branches, of which the lower are 3-4-partite, and the upper simple; the peduncular part of the panicle is strongly flattened, glabrous, 12-15 mm. broad, apparently not much longer than the panicle itself. Floriferous branchlets very rigid, thickish, 6-8 cm. long, 4-5 mm. through, subtorulose, carrying the flowers spirally and rather closely set all round and seated on conspicuous orbicular pulvinuli. *Flowers* furnished with a capillary bracteole 7-8 mm. long, of a very hard coriaceous structure, elongate-conical before expansion, 10-11 mm. long, 3.5-4 mm. through at the base, and narrowed above; calyx cupular, relatively short (3 mm. long) cylindrical with flat base, very slightly 3-toothed, obsoletely veined; corolla 3 times as long as the calyx; the segments lanceolate (always?), terminated by a callous papillose outwardly turned apiculum, obsoletely costulate outside; staminal ring protruding, shortly, beyond the calyx; filaments subulate, spreading; anthers linear-sagittate. Ovary obovate-turbinate, slightly sculptured above; style, 3-sulcate; stigmata punctiform. *Fruit*, small, spherical, or very slightly longer than broad, 12-14 mm. in diam., terminated, slightly excentrically, by the rather conspicuous remains of the abortive carpels, and of the elongate style; whole pericarp 1.5-2 mm. thick. *Seed*, spherical, about 9 mm. in diam. *Fruiting perianth* pedicelliform, terete, 4 mm. through, and 3 mm. high.

Habitat.—Cultivated in the botanical garden at Sydney, but of unknown origin; supposed, however, to be a native of some of the islands of oriental Polynesia. The species was described from complete specimens kindly forwarded by Mr. J. H. Maiden.

Observations.—A quite distinct species, especially characterized by its very coriaceous deeply parted leaf-blade, subglaucous-waxy and dotted with spaced minute lepidia beneath; by the short very rigid spadices, with not many thick torulose floriferous branchlets; by the small globose fruits; by the short calyx and relatively long corolla; and by the segments of the corolla being curiously apiculate-callous at apex, if this peculiarity is not an anomaly.

4. **PRITCHARDIA HILLEBRANDI** Becc. Malesia, III, 292 (excl. of the description of the leaves) t. XXXVIII, f. 4-10; and in Webbia, II (1907), 203, and IV, 218; Rock, Indig. Trees Haw. Isls. (1913), 103.

Washingtonia Hillebrandi O. Kuntze, Rev. Gen. Pl. II (1891) 737.
Eupritchardia Hillebrandi O. Kuntze, Rev. Gen. Pl. III, 2 (1898) 323.
Pr. Gaudichaudii (non H. Wendl.) Hillebr. Fl. Haw. Isls. (1888) 450 (in part).

(Plates II; *A*; XXIV, *T*)

Description.—Of medium size with a stem 6-7 m. high, and a fine crown of large leaves. *Leaf-blade* of a rather rigid and thickish structure, about 1.30 m. long from the ligula to apex, divided into about 60 segments, and having two-thirds of its central part entire, glaucescent from a thin powdery-waxy coating, and devoid of lepidia on the lower surface; the transverse veinlets are scarcely visible, being immersed in the parenchyma; central segments 6-7 cm. broad at their disjunction places, and deeply parted into two very gradually and very finely acuminate, rather stiff points. Petiole about as long as, or a little shorter, than the blade, 3.5-4 cm. broad at apex, very densely covered on the lower surface with a felted, ashy-silvery indumentum, of the appearance of amianthus, which extends also, profusely, on the dorsum of the lower costae. *Spadices* about as long, or even shorter than the petioles (60 cm. to 1 m. long) composed of 3 distinct loose panicles (always), the latter carried on a common rather slender peduncular part, spathes thinly chartaceous, more or less fugaceously covered with silvery wool, finally glabrous. The panicles are 20-30 cm. long, twice branched, at least in their lower part. Floriferous branchlets spreading, rigid, thickish, usually from 8-12 cm. long and 3-4 mm. through at the base, narrowed above, subterete-torulose, carry the flowers (seated on rather conspicuous orbicular pulvinuli) closely spirally arranged, nearly regularly, in 4 longitudinal series; at every flower is a capillary bracteole, 5-8 mm. long. Unopened flowers narrowly oblong and rather suddenly obtusely apiculate, 8-9 mm. long, 4 mm. through; calyx of a rather hard texture, and with a thicker, solid, almost woody base, cyathiform-cylindraceous, very shortly 3-toothed, the teeth not, or only obsoletely marked with convergent veins, otherwise smooth; corolla twice as long as the calyx, the segments oblong, obtusely apiculate, obsoletely 7-costulate outside, truncate and, shortly, 2-auricled at the base; staminal ring shortly protruding beyond the calyx; filaments subulate from a rather broad base, spreading; anthers oblong-linear-sagittate, blunt; ovary depressedly turbinate, deeply sculptured above, suddenly narrowed into a trigonous sulcate style; stigmata punctiform. *Fruit* globose, at times slightly longer than broad, 20-22 mm. long, 17-19 mm. through, with the remains of the sterile carpels and style exactly apical, and marked alongside by two very faint ridges descending from apex; it is at first yellowish or reddish brown and becomes intensely bluish, or nearly black, and with a polished surface at maturity. Whole pericarp 3 mm. thick; the mesocarp is grumous, traversed by a very few slender fibres, sweetish when ripe, and of a date-like taste; endocarp very thin, woody, brittle. *Seed* spherical, 11-13 mm. in diameter. *Fruiting perianth* pedicelliform, cylindrical, 4 mm. through and high.

Habitat.—The Hawaiian Islands. I had supposed that Hillebrand's specimens, upon which the species was founded, came from Molokai, but, as I have pointed out in "Malesia" (p. 294 in a foot-note), much confusion existed regarding Hillebrand's specimens of *Pritchardia,* and relative labels, in the Berlin Herbarium, and the real home of this species is as yet unknown.

Observation.—Hillebrand had incorporated in his *Pr. Gaudichaudii* several quite distinct species. One of these is the present (*Pr. Hillebrandi* Becc), which must be considered as established on the flowers and fruits described and figured by me in "Malesia" (l. c.). Up to the present time there was some uncertainty about the nature of the leaves, belonging to *Pr. Hillebrandi,* but now that Professor Rock has procured me numerous complete specimens of this palm, it has turned out to be one of the better known species of *Pritchardia,* easily distinguishable: by the leaf-blade having the lower surface devoid of lepidia and rendered conspicuously glaucescent by a thin waxy-pulverulent coating; by the petiole being densely woolly on the lower surface, the woolliness extending over the lower main costae; by the glabrous spadices; and by the medium-sized globular fruit carried on a distinct, cylindrical, pedicelliform fruiting perianth. *Pr. Hillebrandi* varies a little in the degree of branching of the flowering panicle, and slightly in the size of the fruit.

In a plant growing in Mr. Young's Kapiolani Park in Honolulu (Rock n°. 12007) undoubtedly referable to *Pr. Hillebrandi,* (the lower surface of the blade being conspicuously glaucous-waxy) the spadix is divided, according to a note of the collector, into 3 distinct panicles—a character visible also in a photograph of that plant, and apparently constant in *Pr. Hillebrandi.*

Note by Joseph F. Rock.

A very robust form of this species with large leaves and petioles measuring 1.50 m. in length and a stiff erect spadix nearly 2 m. long which branches into five distinct panicles, is cultivated on the island of Molokai on the lee-side near Kamalo and in various other places from Kaluaaha toward Halawa. The very robust habit of this plant which differs in several respects from the typical form but only in size and not in shape of seed or flower, might be recognized as a distinct form under the name forma *robusta,* f. n. The fruits are also larger than those of the typical form. The robust size of this plant may, however, be due to the splendid and rich soil in that locality. I have been so far unable to find the typical *Pritchardia Hillebrandi* in a wild state on any of the islands of the Hawaiian group, and so far it is only known from cultivated specimens. On a recent journey in remote regions on Molokai, I was informed by natives that it grew near the sea in Pelekunu Valley, and as it is extensively cultivated on Molokai I presume that it is actually a native of that island. I was unable to verify the statement made by the natives on account of the impassable condition of the mountain pass leading into that valley and the time of the year, which prohibited the landing of any vessel.

5. **PRITCHARDIA INSIGNIS** Becc. in Webbia, IV (1913) 219, f. 13.

Description.—Apparently one of the largest. *Leaf-blade* 1.30 m. long from the ligula to the apex (in one specimen), entire in its central part to above the middle, and parted into about 60 segments; it is of a rather rigid, thickish structure, sub-glaucescent and slightly pulverulent-waxy, and devoid of lepidia on the lower surface, the transverse veinlets are almost obsolete, being immersed into the parenchyma; rachis and lower main costae at first tomentose, but finally almost glabrous. Segments rather stiff, and apparently with not drooping apices, parted to the extent of 15-25 cm. into two very gradually finely acuminate points; the central segments 5-5.5 cm. broad at their disjunction places. Petiole longer than the blade, 4.5 cm. broad at apex, quite glabrous on both faces, slight pulverulent-waxy above; ligula short, crescent-like. *Spadices* apparently shorter than the petioles, rigid, 60 cm. long (in one specimen); spathes thinly chartaceous, more or less fugaceously covered with a silvery wool, finally glabrous; the panicle is about 20 cm. long, with the lower branches 2-4-parted, simply branched above; floriferous branchlets very rigid, erect-spreading, glabrous, have a polished, and not wrinkled surface, even when dry, are thickish, slightly sinuous, subterete, 8-12 cm. long, 4-5 mm. through at the base, narrowed towards the end, covered all around, spirally and rather closely with flowers; the latter seated on orbicular pulvinuli, each of which is furnished with a 3-5 mm. long capillary bracteole. *Flowers* of a very hard structure, when fully developed yet still unopened, 10-11 mm. long, 4 mm. through at the base, and attenuate above; calyx cyathiform-cylindraceous with a flat base, 5 mm. high, relatively thinly coriaceous, and with a somewhat thickened base, smooth outside (not veined), very faintly 3-toothed; corolla about twice as long as the calyx, obsoletely 3-gonous and rather acute at apex, the segments elongate-triangular, not, or only obsoletely veined outside; staminal ring shortly protruding beyond the calyx; the filaments outwardly curved soon after the anthesis; anthers linear-sagittate. Ovary ovoid, sculptured above, gradually narrowed into a rather short, thickish, trigonous, sulcate style; stigma punctiform. *Fruit* spherical, 14-16 mm. in diameter, with the rather conspicuous remains of the sterile carpels, and style exactly apical. Whole pericarp 2 mm. thick; mesocarp grumous. *Seed* 10-12 mm. in diameter. *Fruiting perianth* pedicelliform, subcampanulate, slightly broader than high, the remains of the filaments recurved.

Habitat.—The specimens from which the above description was drawn up were derived from a plant cultivated in the Demerara Botanic Garden at Georgetown in British Guiana and which certainly was of Polynesian, or possibly even of Hawaiian origin. (n°. 7970 and 8800 in the British Guiana Herbarium.)

Observations.—*Pr. insignis* comes near to *Pr. Hillebrandi,* which it greatly resembles in the leaves, which are powdery-waxy and devoid of lepidia on the lower surface, but is distinguishable by its glabrous petioles, by the panicle being less branched, with thicker floriferous polished, terete branchlets, and by its smaller fruits. (N. B.—The fruits represented in Webbia IV, 220 f. 13 are one-tenth smaller than natural size.)

A specimen, in flower, of this *Pritchardia*, n°. 7970 in the Berlin Herbarium, is accompanied by the following note: "Length of petiole 7 ft. 9 in. (2.36 m.), width of leaf 3 ft. 9 in. (1.34 m). Spadix 1 ft. 6 in. (45.6 cm.), erect."

6. **PRITCHARDIA REMOTA** Becc. Malesia, III, 294 and in Webbia, II (1907) 203, and IV, 222; Rock, Ind. Trees Haw. Isls. (1913) 103.

Pr. Gaudichaudii (non H. Wendl.) Hillebr. Fl. Haw. Isl. 450 (in part).

Washingtonia remota O. Kuntze, Rev. Gen. Pl. II (1891) 737.

Eupritchardia remota O. Kuntze, Rev. Gen. Pl. III, 2. (1898) 323.

(Plates II, *B;* XXIII, *O*; fig. 1, IV)

Description.—One of the smallest species of the Genus, 4-5 m. high. *Stem* slender, flexuous, closely ringed, about 15 cm. in diameter; the crown of leaves rather dense and somewhat ruffled. The *leaf blade* measures about 80 cm. from the ligula to the apex, and has a relatively small central undivided part, is chartaceous, concolor on both surfaces, very slightly pulverulent-waxy, especially underneath, where it is also very sparingly besprinkled with very minute punctiform, almost rudimentary microlepidia; all segments are very long and narrow, longer than the central undivided part of the blade, and very deeply divided into two very gradually acuminate points, which end in very long capillary apices; in every sinus is a long filament; the central segments are 3 cm. broad at their disjunction places; the costae are covered with a fugaceous woolliness. Petioles apparently shorter than the blade, 2-2.5 cm. broad, glabrous on both sides, ligula short, rounded. *Spadices* apparently shorter than the leaves, have a peduncular subterete part, about 15 mm. through; the panicle is apparently longer than the peduncular part, rather large, 30 cm. long, glabrous in every part, spreadingly divided into several primary branches, the lowest of which are 15-20 cm. long, and carry spirally, at different heights, as many as 10-12 floriferous branchlets, the lowest of which, at times, divide again, or are forked; in its upper part only the panicle is simply branched. Floriferous branchlets slender, 10-12 cm. long, 2 mm. through at the base and subulate at apex; they carry the flowers, not very crowded, spirally all around, seated on small orbicular convex pulvinuli, each of which is furnished with a very small, 2-3 mm. long bracteole. *Flowers* (unopened) oblong, with a nearly rounded obtusely apiculate top, 8-9 mm. long, 4 mm. through; calyx cyathiform-campanulate, with 3 low but rather acute teeth, thickly coriaceous and smooth in its lower part, and sharply marked (in the dry condition) near the mouth with a thinner finely veined rim; corolla twice as long as the calyx, the segments oblong, strongly and closely striately veined, or rather pluricostulate externally; staminal ring slightly protruding beyond the calyx; filaments subulate from rather broad bases; anthers linear-sagittate; ovary obovoid-turbinate, strongly sculptured above, conically narrowed above into a rather short, thickish, trigonous, sulcate style; stigma punctiform. *Fruit* globose-ovoid, or very slightly longer than broad, 19-20 mm. long, 18-19 mm. through, with the remains of the abortive carpels and style exactly apical, and marked along side by two very faint ridges, descending from apex; whole pericarp about 2 mm. thick; the mesocarp slightly parenchymatous accompanied by several fine fibres; endocarp thinly woody, brittle. *Seed* globular, slightly flattened on the raphe side. *Fruiting perianth* pedicelliform, terete-ventricose, 4 mm. high and through. The apparently nearly completely mature fruit is of a light greenish-brown color and has a polished surface, otherwise it is very similar to that of *P. Hillebrandi.*

Habitat.—Bird Island or "Nihoa," one of the most northerly islands of the Hawaiian group. Professor Rock procured me the specimens, from which the description above is drawn up; they were collected by Capt. Brown of the U. S. Revenue cutter "Thetis." The specimens were accompanied by a photograph, from which are deduced the general characteristics of the plant.

Observations.—It approaches *Pr. Hillebrandi* more than any other. It is, however, a distinct species, characterized by its small dimensions and slender trunk; by the leaf blade being deeply parted into long and narrow segments, filamentose at apex, minutely powdery-waxy on the lower surface, and very sparingly sprinkled with almost rudimentary punctiform microlepidia; by the rather large, much branched panicle; by the oblong blunt flowers, having the calyx distinctly rimmed, and the segments of the corolla strongly striate-pluricostulate; by the globose rather small shiny fruit, carried on a rather conspicuous pedicelliform, terete-ventricose, fruiting perianth.

7. **PRITCHARDIA AFFINIS** Becc. sp. n.

(Plates III, *A, B;* XXII, *K*)

Subelata. Foliorum lamina utrinque virentia necsubtus cerco-pulverulenta, segmentorum lacinis valde elongatis, apicibus tenuissimis flaccidis. Ramuli floriferi graciles, inter flores zig-zag sinuosi fructiferi rigidi, subtorulosi, basi circiter 3 mm. crassi, 8-12 mm. longi. Flores acuminati, 9-11 mm. longi, calyce cyathiformi-campanulato coriaceo, inferne intus solido et sublignoso, breviter 3-dentato, ad dentes venoso; corolla calyce subduplo longiori, petalis extus haud profunde striatis. Fructus mediocris, maturus atro-violaceous, nitidus globosus vel basi paullo attenuatus et globoso sub-clavatus, 20-25 mm. longus, 16-23 mm. diam. Perianthium fructiferum pedicelliforme, cylindraceum vel levissime campanulatum.

Description. Rather tall, approximately 10 m. (—25 m. in height with a beautiful crown (Rock). *Leaves* large; the blade is deeply parted into numerous segments and measures from the ligula to the apex about 1 m.; the mid-costae, especially the lower ones, are clothed, at least in recently developed leaves, with a dense, light-colored or pinkish soft wool. The segments are not very stiff; have their upper part drooping; are very deeply parted into two long, finely acuminate points, filamentous at the apex; both surfaces very finely striated by numerous tertiary nerves, and the transverse veinlets rather sharp; the upper surface quite glabrous; the lower slightly paler but not glaucescent nor powdery-waxy, and distinctly dotted with numerous minute, yellowish, orbicular, or oblong, non-fringed lepidia. Between the segments is a long conspicuous filament; the central and largest segments are 4 cm. broad at their disjunction places. *Spadices* glabrous in every part, apparently composed of one panicle only, carried on a rather robust peduncular part; secondary branches radiately divided into 4-10 floriferous branchlets; the latter are 5-8 cm. long rather narrow, angular (at least when dry, and, at the time of the anthesis, zigzag sinuous between the flowers; bracts at the base of the pulvinuli very fine, deciduous. *Flowers* (unopened) somewhat lanceolate in outline, acute, or even acuminate, 9-11 mm. long, 4-4.5 mm. through; calyx

cyathiform-campanulate, solid and callous at the base, very shallowly 3-toothed, with rather prominent nerves convergent to the apices of the teeth; corolla two and a half times as long as the calyx, obsoletely trigonous; petals inserted a little above the middle of the tube, subtriangular acute or apiculate, not deeply striate outside, the base truncate with rounded (not auricled) sides; staminal ring not, or only slightly protruding beyond the calyx, the filaments erect even after the anthesis; anthers lanceolate, bluntish or obsoletely emarginate. Ovary turbinate, deeply sculptured above; style elongate—conical, sulcate, reaching with its punctiform stigma about to the middle of the anthers. *Fruit* spherical, occasionally narrowed to the base, 23 mm. in diameter; the whole pericarp is 3 mm. thick; mesocarp grumous; endocarp one-half mm. thick. *Fruiting perianth* pedicelliform, slightly campanulate-subcylindrical, 3 mm. high and 4 mm. through.

Habitat.—The Hawaiian Islands. Near Kealia, in the lower forests of South Kona in Hawaii, elev. about 600 m. (Rock No. 12796. Typical but somewhat fragmentary specimen).

Observations.—It approaches *Pr. Hillebrandi* in the flowers and fruit, but it is easily distinguishable from it by the different appearance of the lower surface of the blade, which in *Pr. affinis* is dotted with small, yellowish, orbicular, oblong unfringed lepidia, whereas in *Pr. Hillebrandi* it is glaucous from a thin coating of pulverulent wax, and has no lepidia; the fruit is also a little larger than in *Pr. Hillebrandi.*

To *Pr. affinis* are referable several individuals cultivated in Honolulu, the fruits of which, as Professor Rock learned from old people, were brought from Kona. A fine specimen of what I consider as typical *Pr. affinis,* and of which Professor Rock has procured me a good photograph, is growing in the garden of Mr G. J. Ballentyne, 1559 Thurston Street (Rock No. 12003). In this specimen the leaves have a robust petiole, about 4 cm. broad at apex, tomentose on the lower surface; the ligula is oblong. The spadices appear a little shorter than the petioles, perhaps 70-80 cm. long, and have one panicle only, at the end of a rather robust peduncular part, which, when sheathed by the spathes, is about 3 cm through; the spathes are chartaceous, and more or less temporarily covered with silvery wool. The fructiferous branchlets are thickish (3 mm. through) 8-10 cm. long, angular, torulose and closely zigzag, sinuous between the rather projecting flower-pulvinuli. Fruit exactly as described above. Quite similar to the preceding is another plant, cultivated also in Honolulu, in the garden of Mrs. Gus. Schuman, 1448 Keeaumoku Street (Rock No. 1200).

On the whole, *Pr. affinis* seems to be a variable plant, especially in size, shape of fruit, thickness of the branchlets, and number of lepidia on the lower surface of the leaf-blade, the latter occasionally being even quite absent in var. *gracilis.* Of it we may distinguish the following not sharply defined varieties.

Note by Joseph F. Rock.

The typical *Pritchardia affinis* Becc. grows wild on the southern slopes of Mauna Loa, in South Kona, and is not uncommon at a place called Kaohe and

Opihale, where I measured a specimen 75 feet tall; others were observed 50-75 feet (20-25 m.) in height. The usual size is about 10 m. or even less, especially of the cultivated specimens in Honolulu and on Hawaii. The three palms here reproduced grow at Kaohe in South Kona, the taller specimen mentioned above could not be photographed on account of the brush and trees which did not permit me to get far enough away to get the whole palm on the plate.

Additional specimens were collected at Kaohe, South Kona, Hawaii, in March, 1920, Rock No. 17347 in the College of Hawaii Herbarium.

Pritchardia affinis var. Holaphila Becc.

(Plate IV, *A*.)

Description.—Rather small, 3-5 m. in height. Stem 20-24 cm. in diameter. *Leaves* as in type, dotted underneath with very spaced, minute, suborbicular lepidia. The *spadix*, whole, 80 cm. long, and with one panicle only; the latter about 24 cm. long, twice branched in its lower part and simply above. Floriferous branchlets 7-10 cm. long, and 1.5-2 mm. through (when dry) at the time of anthesis, subangular and slightly zigzag sinuous between the flowers; thicker when carrying the fruits (3-3.5 mm. through) and terete-subtorulose. Spathes covered as usual with silvery wool. *Flowers* a little smaller than in type, with the staminal ring slightly protruding above the calyx. *Fruit* spherical, not slightly narrowed to the base, 20-21 mm. in diameter; otherwise it does not differ from that of the type; when thoroughly mature it is black, has a polished surface, and the mesocarp apparently contains sugar.

Habitat.—Of this palm Professor Rock says that it was collected at Kalapana in the district of Puna, the easternmost point of the Island of Hawaii. It grew among rocks together with *Pandanus* and *Cocos nucifera*, near the sea, in exceedingly dry situations, where the air is saturated with salt spray from the sea, producing a thick haze (Rock No. 12795 in Herb. Becc.).

Observations.—It differs from the type only in its smaller dimensions and in the slightly smaller flowers, having the staminal ring a little more protruding beyond the calyx. The environmental conditions are probably the cause of its smaller stature and of the other trifling peculiarities.

Pritchardia affinis var. rhopalocarpa Becc.

(Plates IV, *B*; XXII, *L*)

Description.—It attains a considerable height and has a slender stem *Leaves* as in type; segments with drooping, very long filamentose apices; their lower surfaces paler than the upper, not pulverulent-waxy, and dotted with very few small, punctiform lepidia. *Petiole* 3.5 cm. broad at apex; ligula oblong rounded at apex, base of the blade and mid-costas strongly woolly, especially on the lower surface. Fructiferous branchlets subterete with subulate apices. Young and half mature *fruits* are obovate-clavate, being, in that period of growth distinctly narrowed to the base; the thoroughly mature fruits, however, are globose oblong, or slightly longer than broad and not narrowed to the base, 25 mm. long, 20-22 mm. through, of a shiny violescent black color. Apparently in the last stage of maturity, the mesocarp thickens at the base more than elsewhere, so as to render obsolete the general obovoid shape of the young fruit; the mesocarp of the mature fruit is slightly bluish, and has a sweet taste. *Fruiting perianth* as in type.

Habitat.—The type specimens of this variety were gathered on the Island of Hawaii, from a plant which was growing on the seashore of South Kona at a place called Napoopoo, near the native temple where the English Captain Cook, who discovered the group of the Hawaiian Islands, was murdered (Rock No. 12779). Others of Rock's typical specimens bear the No. 12780, and come from a grove of palms situated at an elevation of several hundred up to 1000 feet, in Kona, above Kilauea, also in Hawaii.

Observations.—Rock remarks that this variety is very frequently cultivated in Honolulu, and that it is quite likely its seeds were sent there from Kona, where these palms are quite numerous; and I think the specimens of a palm (Rock No. 12001) growing in Mrs. W. Lanz's premises on Punahou street (Honolulu) are referable to it; of this Professor Rock has sent me a fine photograph, showing spadices about as long, or only a little shorter, than the petioles and composed of three superposed partial inflorescences. To the same variety belongs also a plant growing at Queen Liliuokalani's residence at Waikiki (Rock No. 12006). The specimens have immature fruits which are distinctly clavate-oblong.

It seems to me difficult to separate sharply *Pr. affinis* var. *rhopalocarpa* from the type. The wild specimens of the variety differ, however, from the typical *Pr. affinis* in the leaves having very few and very small lepidia on the lower surface, and in the more or less obovoid, or subclavate fruit. I am not certain if the typical *Pr. affinis* has the spadix composed of 3 partial inflorescences, as seems to be the normal case with the variety.

Pritchardia affinis var. **gracilis** Becc.

Description.—A rather small palm, only 3-4 m. high. *Leaves* smaller, otherwise as in type, but devoid of lepidia on the lower surface; the costæ are

slightly woolly; but for them the lower surface is quite glabrous, slightly paler than the upper, and not powdery-waxy; ligula triangular, acute; spathes nearly glabrous. *Flowers* a little smaller than in type, 7 mm. long, 3 mm. through; staminal ring not protruding above the calyx. Floriferous branchlets 5-7 cm. long. The not thoroughly mature *fruits* are obovate, distinctly narrowed to the base, 20-22 mm. long, 16-17 mm. through.

Habitat.—Professor Rock's field note to this palm runs thus: "This rather small palm comes from the driest district of the Island of Hawaii. It grows among lava rocks by the sea in North Kona at Kiholo, it has small leaves and a short trunk, the palms being about 10-12 feet in height. The plants are exceedingly old, as was testified by some of the natives. Kiholo is considered one of the driest regions of Hawaii, with a rainfall of only a few inches a year." (Rock No. 12797 in Herb. Becc.)

Observations.—The immature fruits are exactly like those of equal degree of maturity of var. *rhopalocarpa* and really it may be considered as a subvariety of the latter. Its smaller stature may be set down to the less favorable conditions of its environment, in comparison with those plants, which are living in less exposed situations and in richer soil in the cooler and more humid forests of the mountain slopes. The lack of lepidia may be considered also as a consequence of the climate.

8. PRITCHARDIA LANAIENSIS Becc. et Rock, sp. n.

(Plates V, *A*; XXIV, *V*)

Subhumilis. Folia ampla, utrinque virentia, subtus lepidiis minutis punctiformibus vel angustissime linearibus ferrugineis crebiuscule conspersa. Ramuli floriferi graciles. Flores fere regulariter bifarie alterni, cum inaperti angusti, calyce coriaceo-subcarnoso campanulato venoso, basi nonnihil attenuato, ibique vix calloso, petalis striato-costulatis. Fructus exacte sphaericus, 2 cm. diam. Perianthium fructiferum non pedicelliforme fere explanatum.

Description.—Apparently very similar in general aspect to *Pr. Hillebrandi* but perhaps of smaller stature. *Leaf blade* thinly coriaceous or thickly chartaceous, up to 1.20 m. long from the ligula to apex, entire to about the middle in its central part, almost equally green on both surfaces, but closely spotted underneath with small, unequal, punctiform, or very narrowly-linear, rusty lepidia; central segments 4 cm. broad at their disjunction, parted into two very gradually acuminate rather stiff points; the lateral segments narrower, more deeply parted, and with slender, longer, and apparently drooping points. Petiole about 3.5 cm. broad at apex, covered, on the lower surface with a felted light-colored and pinkish wool, which also extends profusely on the dorsum of the lower costae, and in a minor degree to the upper ones. Entire *spadix* not seen by me (composed of only one or more inflorescences?); the inflorescences at hand have a peduncular part as thick as a man's little finger when sheathed by the bases of the spathes; the latter (3-5) are imbricate, tubular in their lower part and suddenly expand into deeply concave ass's ear-like, rigid, chartaceous, very soon glabrous, shortly

acuminate blades. The flowering panicle is about 20 cm. long, rather densely twice branched in its lower part, and simply above. Floriferous branchlets glabrous, spreading, very slender (1 mm. through, or thereabouts), zigzag sinuous between the flowers. Floral bracteoles extremely fine, setiform. *Flowers* not quite regularly alternate-bifarious; just before expansion are linear-oblong, rather suddenly, and obtusely apiculate, 8 mm. long, 2.5-3 mm. through; calyx of a subfleshy-coriaceous texture, campanulate, very slightly thickened at the base, very minutely 3-toothed, distinctly marked by several veins converging to the teeth; corolla two and a half times as long as the calyx, the segments broadly linear, rather strongly striate-costulate externally; staminal ring rather considerably produced above the calyx; filaments very slender and relatively long, spreading or arched at the time of anthesis; anthers lanceolate-sagittate, bluntish; ovary turbinate, sculptured above, and narrowed into a trigonous sulcate style; stigmas punctiform. The full grown yet not thoroughly mature fruit is exactly spherical, .2 cm. in diameter, centrally topped by the small remains of the sterile carpels and style; the surface is very minutely uneven, and of a rather dull hazelnut color. Pericarp (of the mature fruit) hard, not quite 2 mm. thick, grumous with very few fibers. *Fruiting perianth* nearly explanate (non pedicelliform) the calyx being callous but depressed.

Habitat.—The Island of Lanai, one of the smaller forested Islands of the Hawaiian group. Professor Rock, to whom I am indebted for the specimens from which the above description is derived, writes to me that this palm "grows at the head of the enormous and deep gorge known as Maunalei, at an elevation of 550-660 m. I saw plants of it often, but as they grow on inaccessible cliffs it was impossible for me to collect them and Mr. George Munro, manager of the Lanai Ranch Co., secured the specimens for me."

Observations.—There are no striking diagnostic characters for distinguishing at once this species from the allied species, and especially from *Pr. affinis,* which it resembles in general habit. It is, however, well characterized by the leaf blade being almost equally green on both surfaces, but closely spotted underneath by minute punctiform or linear, rusty lepidia; by the very slender floriferous branchlets with nearly bifarious flowers; by the narrow unexpanded flowers; by the calyx campanulate, veined, fleshy coriaceous, not, or but very slightly thickened at the base; by the striate-subcostulate petals, and especially by the quite spherical, rather small fruit, carried on a nearly explanate (non pedicelliform) perianth.

9. **PRITCHARDIA GLABRATA** Becc. et Rock, sp. n.

Inter minores. Foliorum lamina utrinque virens et glabra, subtus autem lepidiis parvis, orbicularibus, hyalinis, non fimbriatis conspersa, in parte centrali circiter 65 cm. longa et fere usque ad mediam integra; segmentis acute minute, crebreque venoso-striatis, majoribus ad basin 3 cm. latis. Spadix gracilis, spathis chartaceis, elongato-lanceolatis, fissilibus, demum glabris; panicula densiuscule ramosa, ramulis floriferis glabris, gracilibus. Flores spiraliter

alterni et in extremitate ramulorum subdistici, parvi, acuminati, calycc campanulato venoso, basi carnoso. Fructus parvus. Perianthium fructiferum subdepressum, calyce calloso.

Description.—One of the smallest, if not actually the smallest species, as far as can be guessed from the fragmentary specimens seen by me. *Leaf blade* about 65 cm. in length from the ligula to the apex, undivided to about the middle in its central part, and with the periphery cut into about 50 segments, chartaceous, equally green, and closely striated by sharp secondary and tertiary nerves on both surfaces; the lower surface dotted, rather closely, with orbicular very minute, not fringed, hyaline lepidia; the central and largest segments 3 cm. broad at their disjunction places, and divided into two gradually acuminate elongate points; the costae have been apparently slightly cottony in the newly expanded leaves, but are later glabrous on both surfaces. Petiole glabrous, shorter than the blade, (40 cm. long and 2 cm. broad at apex in one specimen). *Spadix* slender, 50-55 cm. long and with one panicle only (the specimen at hand is entire); spathes ass's ear-like, acuminate, chartaceous, fissile, very fugaceously slightly floccose; the flowering panicle is about 15 cm. long, rather densely twice branched in its lower part, and simply above; floriferous branchlets glabrous, slender 5-7 cm. long, about 1 mm. through (about 2 mm. at the fruiting time) slightly sinuous between the flowers. Floral bracteoles extremely fine, setiform, soon deciduous. *Flowers* spirally alternate in the lower part of the branchlets, nearly bifarious above; before expansion they are lanceolate in general outline and acuminate, 7 mm. long, 3 mm. through; calyx of a subfleshy-coriaceous structure, campanulate, somewhat thickened at the base, very minutely 3-toothed, distinctly marked (when dry) by several veins converging to the teeth; corolla twice as long as the calyx; the segments narrowly triangular, acuminate, very sharply striately-veined outside; staminal ring, at the anthesis time, produced considerably above the calyx; filaments extremely fine, deciduous after anthesis; anthers narrowly lanceolate-sagittate, bluntish; ovary turbinate, sculptured above and narrowed into a rather elongate trigonous sulcate style; stigmata punctiform. *Fruit* apparently small, but not seen mature; in the early period of development is ovoid-elliptical and not quite 1 cm. long. The *fruiting perianth* has a rather thickened callous calyx and the remains of the corolla tube and annular ring spreading.

Habitat.—The Hawaiian Islands. Professor Rock sent me recently (July 1918) the specimen of this small *Pritchardia*, collected in the Valley of Iao in the west part of the Island of Maui, where it was growing on the steep cliffs near the entrance of the broad valley, on the right side, at an elevation of 550 m. or less (Rock nº. 14077).

Observations.—It is perhaps the smallest of all known Pritchardias, very characteristic on account of its small and quite glabrous leaves, green, sharply and finely striately secondary and tertiary nerves on both surfaces, having the lower surface dotted with small orbicular hyaline lepidia, visible only by the aid of a lens. The spadix is also glabrous; the panicle rather densely branched; the floriferous branchlets slender; the unopened flowers acuminate; the calyx campanulate sharply veined; the petals also sharply striate. The fruit is certainly small and

when young ovoid; the fruiting perianth can barely be termed pedicelliform as it appears somewhat depressed, with the calyx callous, and the corolla tube and staminal ring spreading.

10. **PRITCHARDIA MACROCARPA** Linden in Revue Hort. 1876, 375 (name only) and 1878, 186; Andre in Illustr. Hort. 1879 105; t. 352 et 1881, 32; Belgique Hort. 1883, 134. *Pritchardia Martii* (non H. Wendl.) Hillebr. Fl. Haw. Isl. 490 (in part); Becc. in Webbia IV. 223, f. 14.

(Plates XII, *A, B*; XXI, *F*)

Description.—A rather low palm with a somewhat bottle-shaped stem and large green leaves. The *leaf blade* measures 9-10-1.15 m. from the ligula to the apex along the central line, is cut to below the middle, at the sides, and to its upper third part in the center, into numerous segments, which are nearly flat (not much folded) and deeply parted into two very finely acuminate, somewhat drooping points; are green on both surfaces, but dotted underneath, rather closely, with very minute, orbicular, or elliptical, light colored, not fringed lepidia; transverse veinlets sharp, very slender and extremely approximate; the central, largest, segments are 4.5-5 cm. broad at their disjunction places. Petiole about as long or even longer than the blade, about 3 cm. broad at apex, glabrous above, more or less permanently woolly tomentose underneath, the tomentum extending to the base of the blade, especially on the dorsum of the costae. Ligula short, crescent like, shortly apiculate. *Spadices* elongate, as long as or longer than the petioles, composed of 2-3 partial inflorescences or distinct panicles, each of which is carried on a long peduncular part. The fruiting spadix is arched-nodding. Spathes more or less furnished with silvery fugaceous paleae. Panicles twice loosely branched in their lower part, simply branched above; floriferous branchlets glabrous, 10-12 cm. long or less, 2 mm. through at the base, somewhat angular (dry) and strongly sinuous between the spirally alternate flowers; every flower is furnished with a long setaceous, deciduous bracteole. *Flowers* (unopened) 9-11 mm. long, 4 mm. through, somewhat acuminate, subtrigonous, and often slightly asymmetrical; calyx campanulate, distinctly narrowed to the base, conspicuously striately veined (dry), the veins converging to 3 rather acute teeth; corolla usually somewhat more than twice as long as the calyx, its segments lanceolate acuminate and strongly striately veined; staminal ring slightly protruding above the calyx; filaments spreading, subulate from a broad base; anthers linear-sagitate, blunt; ovary turbinate, sculptured above and narrowed into a trigonous, sulcate, thickish style; stigma punctiform. *Fruit* very regularly obovate, rounded above and centrically apiculate, tipped by the small remains of the abortive carpels, narrowed from about the middle to a rather acute base, 4-4.5 cm. long, 3-3.5 cm. through, of a dull brown color in the dry state; whole dry pericarp 4-4.5 mm. thick; mesocarp grumous and permeated by few, very fine, longitudinal fibers, especially in its inner part; endocarp woody, 1 mm. thick all around but with a thicker broadly obconical base; the endocarpal cavity polished and white. *Seed* globose-ovate, about 2.5 cm. through, exactly erect; the hilum basal, orbicular, 15 mm. in diam. Embryo places a little above the base. *Fruiting perianth* relatively small, and depressedly pedicelliform, 4 mm. broad and 3 mm. high, having

the remains of the tube of the corolla and of the staminal ring, short, and inconspicuous.

Habitat.—This is certainly the *Pritchardia* which Hillebrand believed to correspond to Gaudichaud's *Livistona Martii*, and which he collected on Oahu; and probably to it belongs a specimen with flowers in his herbarium in Berlin, bearing on the label the note: "Palolo, Oahu (large seed) Hillebr. March 1870." But it is not unlikely that now *P. macrocarpa* has disappeared as a wild growing plant, owing to the great changes which occurred in recent times in the vicinity of Honolulu. Professor Rock, who has very assiduously explored the country around Honolulu, informs me that he has never found this palm in a wild condition, but that a number of these trees are cultivated in Honolulu, and he has actually procured me complete specimens of leaves, flowers, and fruits from one plant (No. 12763 and 14076) growing in the yard of Dr. Hillebrand's old residence in Honolulu. It is therefore obvious that *P. macrocarpa* was one of the species known to Hillebrand and probably the author of the "Flora of the Hawaiian Islands" (published in 1888) is speaking of it when he writes, under the heading of *P. Martii*: "In Nuuanu (one of the valleys a few miles west of Honolulu) until recent times two clumps could be seen from the upper part of the valley, one was completely exterminated when the natives found that the trees were valuable to amateurs of gardening in Honolulu, the other owes its preservation to the absolute inaccessibility of the cliff on which it stands."

It is not surprising that this palm has been introduced by Linden into Europe, it being easy to obtain its fruits from the individuals cultivated in Honolulu.

Observations.—I have accepted the name of *P. macrocarpa* for this fine palm, although no description of it has hitherto been given, except of its fruit, which was said to be of the size of a walnut. The woodcut, however, in the "Illustration Horticole," reproduces a young sterile plant, which agrees pretty well with a photograph (transmitted to me by Professor Rock) of the specimen growing in Dr. Hillebrand's old grounds. This specimen, producing bunches of large fruits, must be considered as the type of *Pr. macrocarpa* as understood by me. Probably in several gardens *Pr. macrocarpa* is reckoned erroneously as the true *P. Martii*, but the type specimen of the latter preserved in the Herbarium Webb at Florence, shows the lower surface of the leaves clothed with the peculiar coating of which I have given a figure in "Webbia," III. t. XXXVIII. f. 15, whereas in *Pr. macrocarpa* that surface looks glabrous; in fact, it is minutely dotted with small inconspicuous lepidia.

In Hillebrand's description of his *Pr. Martii* (which as to the fruit corresponds to *P. macrocarpa*) the leaves are said to be glaucescent below, but that is the main characteristic of *Pr. Hillebrandi*, and it also shows how confused the

material was from which Hillebrand derived the descriptions of *Pr. Martii* and *Pr. Gaudichaudii.*

Before I had seen the leaves, I believed *Pr. macrocarpa* to correspond to *P. Martii,* and under this name the fruit of *P. macrocarpa* was figured in Webbia (IV p. 224 f. 14); but now that Prof. Rock has re-discovered the true *Pr. Martii,* as well as *Pr. Gaudichaudii,* there is no more uncertainty about these two palms, and *Pr. macrocarpa* proves to be a species distinct from both, somewhat allied, however, to *Pr. Martii. Pr. macrocarpa* is well characterized by its small stature, and relatively stout stem; by its large leaves having long petioles and the blade apparently glabrous and green underneath, but dotted, rather closely with appressed, small, orbicular or elliptical, light colored not fringed, microlepidia; it is distinguishable also by the large regularly obovoid fruit, narrowed to the base and minutely apiculate, and by the fruiting perianth depressedly pedicelliform, and having the remains of the corolla and staminal tube scarcely visible, not large and split into several spreading pieces as in *Pr. Martii.*

11. **PRITCHARDIA KAALAE** Rock, sp. n.

(Plates VI, *A, B;* XXI, *H*)

Description.—A palm about 10 metres high, the trunk gray with longitudinal furrows and pronounced rings. *Leaves* very large, dark green on both sides; blade 115 cm. from ligule to apex along the central line, cut into more than 60 segments which are nearly flat, parted for only about 15 to 20 cm. into acuminate drooping points, green on both surfaces, but rather closely dotted beneath with elliptical, slightly-fringed, light-colored lepidia; transverse veinlets very distinct beneath, the lower costae with fawn-colored woolliness towards the base of the blade; petiole in young leaves nearly 175 cm. long, little shorter in mature leaves, 3.5 to 4 cm. wide at the ligule, 14 cm. wide at the base, covered beneath with a rufous-brown detachable wool, the lower margins fringed with fibers, ligule somewhat triangular, apiculate. *Spadix* branching into two distinct panicles, 2.50 m. long including the panicle, long drooping; the spathes green, sparingly furnished with silvery paleae; panicles many branched, the upper branchlets simple, the four lower lateral branchlets again branching; floriferous branchlets glabrous, 9 to 12 cm. long, somewhat angular, not distinctly sinuous; bractlets 5 to 6 mm. long, thin, filiform. *Flowers* small, 8 to 9 mm. long; calyx campanulate, widest at the apex, narrowed at the base, strongly striate, the teeth short and acute; staminal ring protruding, the filaments subulate from a broader base; anthers linear; corolla segments oblong, margins not parallel, strongly ribbed outside, bluntly acute; ovary very small, sub-turbinate, glabrous, style short sulcate; stigmas punctiform. *Fruit* (not perfectly mature) ellipsoidal-ovoid, somewhat asymmetrical at the base, rounded at both ends but narrower at the base, black when ripe, with one or two lateral ridges when dry, 3 cm. long, 2 cm. wide; whole dry pericarp 2 mm. thick; endocarp brittle, less than one-half mm. thick, seed ovoid to subglobose; the hilum large, ovate, 12 mm. long, 8 mm. wide. Embryo a little above the base. *Fruiting perianth* small, only 2 mm. high and 2.5 mm. broad, remains of staminal ring spreading.

Habitat.—Oahu. Waianae range, eastern side of the island in the left fork of Makaleha Valley above a waterfall on the steep ridge, elevation bout 1200 feet or more, at the foot of Mt. Kaala. A grove of this species was found first by me when in company with Dr. and Mrs. H. L. Lyon in the spring of 1918. Specimens were collected by Messrs. A. Holm and O. H. Swezey when I accompanied the party on a collecting trip to that locality.

(Rock) no. 17250 in the College of Hawaii Herbarium.

Observations.—This is a remarkable species and somewhat allied to the Kauai species, especially perhaps to *Pr. Hardyi.* It is remarkable for the long inflorescence which measures over seven feet in length, the small flowers, glabrous panicles, and large leaves, which are not densely tomentose beneath as in the Kauai species and *Pr. Martii* from Oahu, but covered with small, scattered, elliptical, slightly fringed lepidia; the leaf blade is dark green on both sides.

12. **PRITCHARDIA MARTII** H. Wendl. in Bonpl. X. (1862) 199; Seem. Fl. Vit. 274; H. Mann in Journ. of Bot. VII. (1869) 177 Hillebr. Fl. Haw. Isls. (1888) 451; (in part); Becc. Malesia, III. 296, t. XXVIII. f. 14, 15 and in Webbia, II (1907) 203 (not in Webbia, IV (1913) 223, where the fruit described and figured (f. 14) as that of *Pr. Martii* is of *Pr. macrocarpa;* Drake del Cast. Ill. Fl. Ins. Pac. VII. 323; Rock, Indig. Trees Haw. Isls. (1913) 101.

Livistona? Martii Gaud. Voy. de la Bonite, t. 58, 59 Mart. Hist. Nat. Palm III. 242, 319 (Martiana).

Eupritchardia Martii O. Kuntze, Rev. Gen. Pl. III. 2 (1898) 323.

Washingtonia Martii O. Kuntze, Rev. Gen. Pl. II. (1891) 737.

Chamaerops Martii Rev. Hort. 1875, 32.

(Plates VII, *A;* XXI, *E*)

Description.—A rather short stemmed palm, 3-5 m. high with a head of robust, rigid leaves. The leaf blade measures about 80 cm. in length from the ligula to apex, is of a thickish coriaceous structure, and deeply cut into numerous segments; has the lower surface of a yellowish or slightly tawny color (when dry), and is very densely clothed with an appressed felt or tomentum, composed of conspicuous, nearly confluent lepidia, leaving very small patches of epidermis uncovered; the lepidia are about as long as broad, very irregularly fringed with relatively large hair-like curved and falcate hyaline cells; the segments are rather deeply parted into two very finely acuminate non-drooping points; central segments 4.5 cm. broad at their disjunction places. Petiole robust, about as long as, or shorter than, the blade, covered in newly expanded leaves with (apparently fugaceous) silvery scales on the upper surface and with a thin appressed tawny tomentum underneath, the latter extending (but apparently also not permanently) to the main costae. *Spadices* elongate, composed of 3 or 4 partial inflorescences or panicles, each of which is sustained by a distinct peduncular part; the general peduncular part is 85 cm. long in one specimen. Spathes rigid, chartaceous, nearly glabrous, being sprinkled only here and there with silvery fugaceous paleae; the panicles are about 20 cm. long, rather loosely branched, twice in their lower

part, simply above; floriferous branchlets glabrous, angular (when dry) and strongly sinuous between the spirally alternate flowers; every flower is furnished with a very long deciduous, setaceous bracteole; fructiferous branchlets subtereteto-torulose, 8-10 cm. long, 2 mm. through at the base. *Flowers* (unopened) 9-10 mm. long, 4 mm. through, somewhat acuminate, and subtrigonous; calyx campanulate, distinctly narrowed to the base, with 3 rather acute teeth, conspicuously (dry) veined; corolla about twice as long as the calyx; the segments lanceolate, more or less acuminate, strongly striately-veined; staminal ring considerably protruding above the calyx; filaments spreading, subulate from a broad base; anthers linear sagittate, blunt; ovary oblong turbinate, sculptured above and narrowed, rather suddenly, into a trigonous, sulcate thickish style; stigmas punctiform. Fruit (immature?) ellipsoidal, narrowed towards both ends, but especially above, and pointed, about 4 cm. long and 28 cm. through (in Gaudichaud's figure). The *fruiting perianth* has the calyx depressedly pedicelliform, callous; but the corolla tube, and the staminal ring protrude considerably beyond the calyx and split into few parts, which are conspicuous objects spreading at the base of the fruit.

Habitat.—The Hawaiian Islands. It was first discovered by Gaudichaud most certainly in the eastern part of Oahu, where it has been collected by Professor Rock in Oct. 1912 (no number) on the edge of precipices at the head of Palolo Valley at over 600 m. elevation, and in Wailupe Valley (n°. 10361) in January 1915, also at about the same elevation. In the Berlin Herbarium are preserved portions of spadices with flowers, apparently belonging to *Pr. Martii,* collected by Lydgate at Cape Niu, also in Eastern Oahu. *Pritchardia Martii* has recently been collected west of Nuuanu Pali, at the head of Moanalua Valley by O. H. Swezey and E. Bryan, also on the windward side on steep cliffs of Waiahole Valley, by O. H. Swezey while on a collecting trip in company with H. P. Agee. The Waiahole and Moanalua specimens are said to have a simple, unbranched spadix, while those occurring in the eastern range have the spadix branched into three or four distinct panicles. The fruits of the Waiahole specimens were immature, while those of the Moanalua specimens were nearly mature and of a subspherical shape, agreeing well in size and form with a mature fruit collected in Palolo Valley.

Observations.—I think that now this old and up to the present imperfectly known species has been exactly identified by means of the specimens collected lately by Professor Rock. Unhappily these specimens carry immature fruits only, which, therefore, look smaller than those represented in Gaudichaud's work, to which otherwise they agree exactly in their regular ellipsoidal shape, and to which it is believed that later they would agree also in size. Prof. Rock wrote me (June 2, 1918) that he went to Palolo Valley and Wailupe Valley into the mountains of Oahu, but that he was not so far able to secure ripe fruits of the typical *Pr. Martii.* He says that in those mountains there are many rats and mongooses which eat the young fruits and that he has actually found rat's nests on the palm of Palolo. More recently, however, Professor Rock has succeeded

in obtaining some thoroughly mature fruits of the Palolo palm, growing at Konahuanui (the highest peak on the Koolau range) which proved to have an entirely different shape from those described above, not being elliptical, but globose and semi-spherical. It is therefore not at all impossible that the fruit figured by Gaudichaud was also an immature one, as it seems a rather common occurrence in Pritchardias for the fruit to change in shape until it has reached maturity.

In the picture of the fruit of *Pr. Martii,* in Gaudichaud's work are particularly visible the remains of the corolla tube and staminal ring spreading under the fruit, a peculiarity which I have not observed so marked in any other Pritchardia, but which is very plain in Rock's mentioned specimens. Furthermore, the correspondence of the nature of the hairy indument of the lower surface in the leaf blade of Rock's specimens, with that of the actual typical Gaudichaud's specimens is perfect.

Rock's specimen collected in Palolo Valley is accompanied by a small photograph taken (in situ) on the very edge of a precipice. It shows a rather low palm with a short and relatively stout stem and rigid leaves with robust petioles. The specimens from Wailupe Valley (the valley between Palolo and Niu Valley) are accompanied by the following field note: "The palm is short, only 10-15 feet (3-5 m.) tall. The inflorescence branches 3 times (in another note it is 4 times), the fertile flowers are borne on the last branch and densely clustered, while the two lower branches are sterile." Apparently the three inflorescences or panicles, into which the spadix divides, do not expand the flowers at the same time, and probably only a single panicle, the terminal one, produces fruits; but I have not been able to discover any organic difference in the flowers of the various inflorescences; probably there is only a kind of dichogamy between the flowers on the inflorescences of the same spadix.

Pr. Martii is well characterized by its relatively small stature and rather thick short stem; by the peculiar tomentum clothing the lower surface of the leaf blade; by the long spadices composed of 3-4 distinct panicles; and especially by the large, ellipsoidal (or at complete maturity subglobose?) pointed fruit, borne by a perianth having the calyx callous and pedicelliform and the remains of the corolla tube and staminal ring split into a few conspicuous spreading parts. It differs from *Pr. macrocarpa,* to which otherwise *Pr. Martii* is related, in the tomentose undersurface of the leaves, and in the conspicuous pieces of the fruiting perianth. The flowers of *Pr. Martii,* however, are barely distinguishable from those of *Pr. macrocarpa.*

13. **PRITCHARDIA GAUDICHAUDII** H. Wendl. in Bonpl. X. (1862) 199; Seeml Fl. Vit. 274; H. Mann in Journ. of Bot. VII. (1869) 177; Becc. Malesia III, 295 (excl. descript. of spadix and flowers) pl. XXXVIII. f. 11-12; in Webbia, II. 203 et IV. 208, 223; Hillebr. Fl. Haw. Isls. 450 (as to the plant from Molokai only); Rock, Indig. Trees Haw. Isls. (1913) 100.

Livistona ? Gaudichaudii Mart. Hist. Nat. Palm. III, 242, 319.

Eupritchardia Gaudichaudii O. Kuntze, Rev. Gen. Pl. III. 2 (1898) 323.

Washingtonia Gaudichaudii O. Kuntze, Rev. Gen. Pl. II. (1891) 737.

(Plates VIII, *A, B;* XX, *B*)

Description.—Somewhat different in general habit from the other Pritchardias. The trunk is rough and from 0.60 to 1.50 m. in height, broad at the base, and attenuate towards the apex. *Leaves* relatively small and very robust, the blade is of a relatively thick structure, nearly leathery, and measures 65-70 cm. from the ligula to the apex, is entire to about the middle in its central part, and cut into relatively not very numerous, broad and rather short segments which divide into two long-acuminate stiff (not drooping) but at times slightly falcate laciniae; the entire blade acquires, in the herbarium specimens, more than any other species, a brown tawny color, deeper below than above; moreover the lower surface is furnished with numerous, yet non-confluent, lepidia which leave good portions of epidermis uncovered, and are scale-like, hyaline, unequal, at times relatively large, lanceolate or elliptical and slightly fringed, especially at their extremities; the central, largest, segments are 5.5-6 cm. broad, apiculate in the centre. Petiole robust, shorter than the blade (55 cm. long and 4 cm. broad at apex in one specimen). In young leaves, the petiole and the base of the blade, on both surfaces, is very densely clothed, more or less permanently, with a silvery or amianth-like woolliness, which is persistent underneath on the mid-costae. *Spadix* about 1 m. long, usually composed of a single panicle carried on a long peduncular part; yet occasionally a second panicle is developed; spathes rigid, chartaceous, at first-scaly paleaceous, later glabrous. The panicle is about 25 cm. long, loosely twice branched in its lower part, and simply branched above, very fugaceously and slightly covered, in youth, with a fulvous soft wool, otherwise glabrous; floriferous branchlets 8-10 cm. long, somewhat angular, when dry, and strongly sinuous between the spirally alternate flowers, 2-3 mm. thick and subterete at the fruiting stage; every flower is furnished with a capillary, deciduous, bracteole. *Flowers* (unopened) 8-9 mm. long, 3 mm. through, narrowed a little above, shortly apiculate, and often slightly asymmetrical; calyx urceolate-campanulate, somewhat narrowed to the base, marked by conspicuous veins convergent to the short, sharp pointed teeth; corolla somewhat more than twice as long as the calyx, its segments broadly, irregularly linear, subhastate, or little narrowed above, obtusely apiculate, strongly striately-veined; staminal ring about level with the mouth of the calyx; filaments very slender, subulate; anthers linear-sagittate, blunt; ovary turbinate, sculptured above, and narrowed into a thickish trigonous, sulcate style; stigmas punctiform. *Fruit* quite symmetrical, spherical, 38-43 mm. in diam., centrically terminated by the very minute remains of the style and abortive carpels; the surface smooth and nearly shiny, not or very faintly marked by longitudinal ridges; of a hazelnut brown color in herbarium

specimens; whole pericarp 4-5 mm. thick; mesocarp grumous and permeated by rather numerous, sinuous, branched fibers; endocarp about 1 mm. thick all around, but thicker at the base, the endocarpal cavity nearly polished white. *Seeds* spherical about 3 cm. through; hilum orbicular, 12-14 mm. in diameter; embryo placed a little above the base. The immature fruit is oblong. *Fruiting perianth* callous, depressed, 5 mm. broad, 2 mm. high.

Habitat.—I hope to have correctedly identified this old species first discovered by Gaudichaud in the Hawaiian Islands, with the specimens of a palm collected by Professor Rock, in May, 1918, on the north coast of Molokai and growing on the cliffs of the Waialeia gorge, immediately above the leper colony of Kalaupapa, at an elevation of about 750 m. (Rock No. 14074). Professor Rock writes to me that he observed the same palm also on the rock islets off the precipitous cliffs whence he obtained his specimens, but he was unable to land on the islet owing to the rough sea. There is not the shadow of a doubt, however, that such islets must once have been part of the overhanging cliffs and that the palms growing thereon were derived from the heights above. It was on these islets that Lydgate collected the fruit, of which I have given a figure in "Malesia" III. b. XXXVIII. f. 11-13, and which corresponds exactly to those of Rock's specimens. That this Molokai palm is really one of the two collected by Gaudichaud in the Hawaiian Islands is extremely probable, in consideration of the fact that clumps of it are plainly visible from the sea, and very likely had been noticed by the naturalists of the "Bonite."

Observations.—Professor Rock, in a letter regarding the palm in question, says that the fruits of *P. Gaudichaudii* "germinate readily, as the ground below the old palms is a mass of young ones." And it is not perhaps too rash to fancy that the palm of which Gaudichaud took living specimens and, in his herbarium, recorded, was smaller than *Pr. Martii,* was growing in the places and under the conditions mentioned by Rock. But the best argument for the identification of *Pr. Gaudichaudii* with the palm of the cliff of Molokai, rests on the perfect correspondence of the nature of the indument that covers the lower surface of the leaves of the type specimens with that covering those collected by Rock. Gaudichaud's type specimens of *Pr. Gaudichaudii* consist only of leaves of very young plants, and have the peculiar tawny color shown also by those recently gathered. Professor Rock remarks also that this species has a different aspect from the other Pritchardias by reason of its small stature and rigidity, probably a consequence of the exposed location in which it grows. *Pr. Gaudichaudii* is especially characterized by its large spherical fruit, and by the leaves, which have the lower surface not completely covered with relatively large, scale-like hyaline narrow and long lepidia. As a subsidiary character may also be mentioned the brown color acquired in the herbarium specimens by the lower surface of the leaves, and also by the flowers.

Note by Joseph F. Rock.

Pritchardia Gaudichaudii evidently occurs in all the gulches and valleys, or rather on the ridges between them, from Waialeia to Pelekunu. In Pelekunu proper many palms were observed growing on the steep cliffs of that valley, but no specimens could be collected. Waikolu Valley has also numerous palms growing on the steep walls along waterfalls, whether they all belong to *Pritchardia Gaudichaudii* or represent new species must be left for future explorers. In Waiakapuu Valley the typical *Pritchardia Gaudichaudii* was collected with perfectly spherical fruits; the panicles, however, retained their tomentum more or less. Rock No. 17346 in the College of Hawaii Herbarium.

In O. Meyer's place at Kalae, Molokai, there is a palm in cultivation which must be referred to this species, although no mature fruits could be collected. Rock No. 17340 in the College of Hawaii Herbarium.

14. PRITCHARDIA FORBESIANA Rock sp. n.

(Plate IX, *A, B*)

Subhumilis. Foliorum lamina firme tenuiter coriacea, utrinque virentia subtus lepidiis minutissimis, linearibus, ferrugineis, crebriuscule conspersa, in parte centrali circiter 90 cm. longa, usque ultra medium integra; segmentis ad 57, majoribus 35-38 cm. longis et ad basin 6 cm. latis profunde bifidis, laciniis acuminatis, rigidis. Spadix brevis et indivisus, paniculam simpliciter ramosam et breviuscule stipitatum ferens; spathis dense appresseque tomentosis; ramulis floriferis fugaciter piloso-floccosis. Flores spiraliter alterni, dum clausi oblongi, obtusiusculi, 8 mm. longi, 4 mm. crassi; calyce cyathiformi-campanulato, basi paullo attenuato, obsolete 3-dentato, glabro, obscure venoso; corolla quam calyx duplo et paullo ultra longiori; urceolo staminali non, vel vix, ex ore calycis exerto, petalis obtuse pluricostulatis. Fructus maturus globosus, 3-3.5 cm. diam. symmetricus; immaturus ellipsoideus, acutis. Perianthium fructiferum depresse pedicelliforme, urceoli staminalis e calyce calloso paullo exertis.

Description.—A short stemmed palm, trunk 3-4 m. (5 m. C. N. F.) high with a small rigid crown. *Leaf blade* 72 cm. long from ligule to apex; number of segments about 60; width of median segments 4.5 cm. at their disjunction, divided for about 26 cm. into long acuminate non-drooping points, dotted beneath with elliptical scale-like, slightly fringed to subentire, yellowish lepidia; transverse veinlets very prominently protruding; the lower costae on the under surface of the leaves covered with reddish brown wool, glabrous above. Ligule triangular in young leaves, crescent shaped in old leaves; petioles about as long as the blade or shorter, width at ligule 4 cm. *Spadix* evidently simple, the spathes ovoid oblong, acute or bluntly acuminate, densely covered outside with a detachable rufous brown wool; panicle short, about 12 cm. long, with many simple branchlets in the upper and middle part, the few lower branchlets dividing once or twice; branches 8 to 10 cm. long, apparently less than 2 mm. through, terete, but somewhat angular when dry, sinuously twisted, with large orbicular projecting pulvini on which the flowers are borne; whole panicle with grayish to yellowish hair or

palea, scattered over its surface; bracts at the base of the pulvini filiform, about 6 mm. long. *Flowers* (unopened) 8 mm. long; calyx short cup-shaped, subtruncate at the apex, the minute teeth bluntly acute, 4 mm high, 3 mm. through at the base, slightly wider at the mouth, dull and inconspicuously striate; petals linear-oblong acute, 6 to 7 mm. long, of even width throughout, 1.5 mm., apex acute, somewhat striate, especially near the base; staminal ring not or only slightly protruding; filaments short and broad; anthers linear-oblong. Ovary turbinate, sculptured above and terminating more or less abruptly into a slender trigonal style 2.5 mm. long; stigmas minute, punctiform. Fruit ovoid to subglobose when mature and rounded at both ends, 4 to 4.5 cm. long, 3.2 to 3.5 cm. in diameter, slightly asymmetrical at the base; whole pericarp 5 to 6 mm. in diameter; mesocarp grumose and transversed by branching coarse fibres; endocarp hard, woody, light-colored; diameter of seed cavity 22 mm. *Seed* ovoid acute at the apex, rounded at the base; hilum trigonal in outline; embryo situated immediately above the margin of the raphe.

Habitat.—Maui, western portion in the Honokohau Drainage Basin at the foot of Mauna Eke, elevation over 3000 feet, on a small plateau immediately under Mauna Eke, which is only a few hundred or one thousand feet higher. The palm was observed and photographed by the writer, August, 1918, when in company with Mrs. H. P. Penhallow, and T. Hashimoto. No specimens were collected owing to the fact that the palm was without flowers and fruits. The type No. 472 M. is in the B. P. Bishop Museum and was collected by C. N. Forbes, to whom the writer is indebted for the loan of material, and for duplicate specimens which have been deposited in the College of Hawaii Herbarium.

Observations.—A palm of the stature of *Pritchardii Gaudichaudii* and evidently related to that species; the fruits are not exactly spherical, and smaller; the flowering panicle is also much smaller, the branchlets shorter, with large, conspicuous, orbicular pulvini with long bracts at their bases; the flowers are closer set, especially near the apex. The calyx is faintly striate, of nearly equal width and subtruncate. A distinguishing feature is found in the spathes which are densely covered throughout the outer surface with a reddish brown, persistent but detachable wool. The lepidia on the undersurface of the leaves are apparently identical with those found on *Pritchardia Gaudichaudii.*

15. PRITCHARDIA LOWREYANA Rock in lit.

(Plates X, *A*, XX, *A*)

Mediocris, caudice 2 et ultra m. longo. Folia utrinque virentia, subtus crebre microlepidiis minutis pallidis punctiformibus vel breviter linearibus non fimbriatis praestita, segmentis rigidis. Spadix ultrametralis, bipartitus. paniculis duplicato ramosis, ramulis glabris. Flores 8-9 mm. longi, calyce campanulato basi attenuato acute venoso. Fructus in genere maximus, ovatus, conice terminatus acutus 6 cm. longus 4 cm. in medio crassus, basi paullo attenuatus, ibique rotundatus semine ovato, superne conico. Perianthium fructi ferum depressum.

Description.—A somewhat larger plant than *Pr. Gaudichaudii*, and equally endowed with robust rigid leaves; the trunk 2 m. long or more. *Leaf blade* of a

thick almost leathery structure; it measures about 1 m. from the ligula to the apex, is entire to above the middle in its central part, otherwise cut into rather numerous large segments, which soon subdivide into two long, acuminate, stiff (non-drooping) usually slightly falcate laciniae; it is apparently equally green and glabrous on both surfaces, but is closely dotted underneath with minute, light colored, orbicular, elliptical, or shortly linear not fringed lepidia; the central, largest, segments are up to 6 cm. broad at their disjunction places; ligula large, rounded-oblong. Petiole robust, a little shorter than the blade (90 cm. long, and 4 cm. broad at apex in one specimen). In the adult leaves, the petiole and the base of the blade are almost glabrous on both surfaces, except on the lower costae, which are more or less permanently cottony. *Spadix* (whole) 1-1.20 m. long, and drooping; it divides into two partial inflorescences, but of these only the upper one bears an enormous cluster of fruits (Rock). The spathes sheathing the long peduncular part, are, at the fruiting stage, glabrous, much slashed and marcescent. The fruiting panicle is dense, has the lower branches divided into 2-3 branchlets, and is simply branched above; floriferous branchlets glabrous, 10-12 cm. long, slender and somewhat angular (when dry) and strongly sinuous between the spirally alternate flowers; at the fruiting stage are subterete and 2-3 mm. thick. Every flower is furnished with a capillary deciduous bracteole. *Flowers* (unopened) 8-9 mm. long, 3 mm. through, very similar to those of *Pr. Gaudichaudii*, narrowed a little above acute and often slightly asymmetrical; calyx campanulate, narrowed to the base, distinctly veined, the veins converging to the short sharp pointed teeth; corolla somewhat more than twice as long as the calyx; its segments broadly irregularly linear subhastate, acute, strongly striately veined; staminal ring about level with the mouth of the calyx; filaments subulate; anthers linear, sagittate, blunt. *Ovary* turbinate, sculptured above, and narrowed into a thickish, trigonous, sulcate style; stigmas punctiform. *Fruit* very large, quite symmetrical, ovoid, broadly conical in its upper part, acute, 6 cm. long, 4 cm. through at its middle, slightly narrowed to the base, which, however, is rounded; the surface is smooth and rather shiny, not, or only very faintly, marked by longitudinal ridges; it is of a deep brown color in the herbarium specimens, but the mature fruit is black (Rock); whole pericarp 5-6 mm. thick, mesocarp grumous and permeated by rather numerous sinuous branched fibers; endocarp woody, about 1mm. thick on the sides, pointed and considerably thickened at the base; the endocarpal cavity is nearly polished white. *Seed* ovate, conical in its upper part; hilum orbicular, 12-14 mm. in diameter. *Fruiting perianth* callous, depressed, very shortly pedicelliform.

Habitat.—*Pr. Lowreyana* was discovered in June, 1918, by Professor Rock at Waialeia on Molokai, immediately above the leper colony, at an elevation of about 650 m. It was found at the same time with *Pr. Gaudichaudii*, not, however, on the cliffs overhanging the sea (the station of the latter) but inland on the flats, and was growing among masses of *Freycinetia arborea* Gaud. Professor Rock distinguishes this fine palm with the specific name of Lowreyana in "honor of the late Mrs. F. J. Lowrey of Honolulu, an ardent admirer of palms, who was in a measure responsible for the embellishment of this city."

Observations.—It is related to *Pr. Gaudichaudii* and must have had a common derivation with it. The flowers of the two plants are almost indistinguishable

the one from the other, but *Pr. Lowreyana* is the larger plant of the two, and is quite distinct from *Pr. Gaudichaudii* in its larger, ovate, conically pointed fruit, and in the different aspect of the lower surface of the leaf-blade, which is dotted with a quite different form of lepidia.

Pritchardia var. turbinata Rock v. n.

(Plates X, *B;* XXII, *J*) v. n.

Description.—A palm of the habit of *Pritchardia Gaudichaudii* but somewhat larger and thus intermediate between the former and *Pritchardia Lowreyana* Rock. Trunk 1.5 m. or slightly more. *Leaf blade* thick coriaceous, 88 cm. long from ligule to apex, the segments divided about 30 cm. into stiff non-drooping acuminate points, which are slightly falcate as in the species; dark green above and paler beneath and dotted with oblong-elliptical yellow non-fringed lepidia; petiole about 80 cm. long. *Spadix* branching into two separate panicles, long drooping but shorter than in *Pr. Lowreyana* Rock. *Flowers* as in the species, the calyx less conspicuously striate. *Fruit* ovoid, acute at both ends, black when mature, 4.5-5 cm. long including the fruiting perianth, nearly 3 cm. in diameter; exocarp very thin; mesocarp slightly grumous and permeated by less numerous branched fibers; endocarp pale yellow, silky glossy, with numerous impressed branching veins and reticulation; whole pericarp 2.5 mm. thick. *Seed* subglobose, but pointed at the apex, broader than high, 22 mm. in diameter; embryo situated immediately above or at the upper margin of the hilum.

Habitat.—Molokai on the Waialeia ridge in company with *Pritchardia Gaudichaudii, Freycinetia arborea* Gaud., *Sadleria,* etc.

Observations.—This variety differs from the species in its smaller stature, which approaches that of *Pr. Gaudichaudii,* but mainly in the fruits which are smaller and evenly pointed at both ends, being thickest at the middle; the panicles are shorter than in the species and also smaller. The whole pericarp is very thin, only about 2 mm. instead of 4-6 mm. as is the case in *Pr. Lowreyana.* It might be regarded as a distinct species, but fruits of Pritchardia vary considerably; possibly intermediate between *Pritchardia Gaudichaudii* and *Pritchardia Lowreyana.* Hybridisation very likely occurs in Pritchardia through anemophily. The locality in which the two mentioned species and variety grow is exposed to the trade winds which sometimes assume the velocity of a gale. The variety in question, of which there were two or three plants, grew in a clump of *Pritchardia Gaudichaudii. Pritchardia Lowreyana* grew several hundred yards inland on the flats, but in line with the prevailing wind. Entomophily must, however, also be considered, since the flowers are usually visited on sunny days by native wasps and bees. The type is No. 17344 in the College of Hawaii Herbarium.

16. PRITCHARDIA BREVICALYX Becc. et Rock, sp. n

(Plate XXIII, *P*)

Foliorum lamina ampla haud spisse subcoriacea, utrinque virentia, subtus lepidiis minutissimis crebriuscule conspersa, in parte centrali circiter 1.50 m. longa, profunde multisecta; segmentis numerosissimis, elongatis, flaccidis; majoribus 3.5 cm. basi latis; omnibus profunde bifidis, laciniis pendulis, longissime acuminatis et in apicem filamentosum extenuatis. Spadix amplus, elongatus, fere a basi in 3 inflorescentias partiales divisus; spathis chartaceis, cito glabris; paniculis 25-30 cm. longis, laxe ramosis; ramulis floriferis tenuibus, glabris. Flores laxe spiraliter alterni, 12 mm. longi, calyce campanulato, basi valde angustato, 4 mm. in ore lato et minus alto, acute 3-dentato et venoso; corollae et staminum tubo calycem duplo et ultra superanti; petalis asymmetrice lanceolatis et plus minusne flexuose acuminatis. Fructus globoso-subobovatus, basi symmetricus, apiculatus, 30-33 mm. crassus et paullo ultra longus; mesocarpis grumoso. Perianthium fructiferum depresse pedicelliformi, urceoli staminalis exuviis e calyce calloso paullo exertis.

Description.—A rather large palm of the size and habit of *Pr. Hillebrandi*. *Leaf blade* of a not very thick structure, measuring about 1.50 m. from the ligule to the end of the central segments, equally green on both surfaces, sprinkled underneath with minute lepidia, otherwise glabrous; the segments are very numerous, relatively narrow, flaccid and long, deeply divided into two very long acuminate hanging laciniae which taper very gradually to an extremely fine, very long, filamentose apex; the largest intermediate segments are 3.5 cm. broad at their disjunction, and 60-70 cm. long if the capillary end is taken into account; the outer segments are narrower and shorter, but equally bifid, and have also filamentose apices. Petiole quite glabrous; ligula asymmetrically crescent-like, apiculate in the middle; the young leaves are covered at the base, especially on the dorsum, with a soft light-colored, detachable fluff. *Spadix* elongate (1.40 m. long in one specimen) composed of 3, almost equal, partial inflorescences, which arise separately from within the mouths of the lower spathes, near the base of the main rachis, the one a little above the other; the general sheathed peduncular part is 3.5 cm. thick. The partial inflorescences are composed of a loose panicle, borne by a long rachis, which is as thick as a finger, and is sheathed by 4-5 rather spaced spathes; the latter are tubular in their lower part, and expand above into a rather broadly lanceolate, rigid-chartaceous, concave, ass's earlike, pointed blade; in youth, the spathes are more or less furnished with a silvery or amianth-like fluff, which very soon disappears, leaving their surface quite glabrous. The panicle has the lower branches 2-3-partite, and simple floriferous branchlets in its upper part; the fructiferous branchlets are quite glabrous, terete 10-12 mm. long, 2 mm. thick at the base, and have tubulate apices. *Flowers* rather loosely spirally alternate, rather large, the unexpanded ones are 12 mm. long and somewhat asymmetrically acuminate; calyx glabrous. shortly campanulate, not quite 3 mm. high and 4 mm. wide at the mouth, contracted to a narrow base, and marked by sharp veins converging to 3 triangular very acute teeth; the staminal and corolla tube protrudes considerably beyond the calyx, being twice and more as long as the latter; the stamens have rigid radiately

spreading filaments; ovary turbinate; petals irregularly lanceolate, having more or less wavy acute or acuminate apices. The *fruit*, when thoroughly mature, is globose-ovoid, or subobovoid, acutely mucronate by the remains of the sterile carpels, symmetrical at the base, 35-37 mm. long; 30-33 mm. through; of a hazel nut brown color, and with a nearly polished, slightly uneven surface; the young fruit is elliptical or subobovate-elliptical, and tapering towards the base; mesocarp grumose, not fibrous; endocarp thin but very hard. *Seed* spherical. *Fruiting perianth* depressedly pedicelliform; the calyx callose; the staminal and corolla tube form a narrow toothed ring.

Habitat.—The Island of Molokai. It was collected by Professor Rock in May, 1919, in Wailau Valley, where presumably it was a cultivated plant. No. 16000 of the College of Hawaii Herbarium.

It differs from all the Pritchardias known to me in its very short, sharply 3-toothed, campanulate calyx, and in the very elongate corolla and staminal tube, which protrudes considerably outside the mouth of the calyx. It is also characterized by its glabrous floriferous branchlets, by the large leaf blade, green on both surfaces, and sprinkled underneath with minute lepidia, but otherwise glabrous, and cleft into relatively long segments, which have extraordinarily long, hanging, filamentose apices; and finally by its rather large globose-subobovoid, symmetrical fruit. It does not seem to me closely related to any other species, but it may be, however, located in the conspectus with the species having glabrous floriferous branchlets, and fruits over 3 cm. in diameter.

17. **PRITCHARDIA BECCARIANA** Rock. Torrey Bot. Club Bull., 1916, 43:386, Pl. 21.

(Plates XI, *A, B;* XXIII, *M; fig.* I, II a and b.)

Elata, caudice gracili leviter flexuoso, foliis amplis suborbicularibus, petiolo elongato, lamina tenuiter coriacea, subtus lepidis numerosis, parvis, ellipticis, hyalinis, fimbriatis conspersa. Spadix 3-5 partitus, paniculae ramis glabris et inter flores sinuosis. Flores remotiusculc spiraliter alterni, pro rata majusculi et angusti (12-13 mm. longi, 3.5 mm. crassi); calyce cyathiformi-cylindraceo, sublignoso, laevi vel ad denticulos obsolete nervoso; corolla calyce duplo et ultra longiore, segmentis sublinearibus; annulo staminali conspicue ultra calycis faucem producto; ovario apice non sculpto, in stylum sensim attenuato. Fructus majusculus (2.5-3 cm diam.) globosus, vel globoso-oblongus, utrinque rotundatus, basi saepe paullo asymmetricus. Perianthium fructiferum depressum, brevissime pedicelliforme.

Description.—A beautiful palm having a slender, slightly sinuous and closely ringed stem 15-18 m. high, 20 to 30 cm. in diameter, with a large globular crown of leaves (Rock). The *leaves* of young plants have petioles up to 3 m. long reduced, however, to 1.20 m. in the adult plant. Leaf blade nearly explanate, very large, nearly orbicular, of a thinly coriaceous, tough structure, green, dotted rather densely on the lower surface, with small, hyaline, irregularly elliptical, fringed lepidia; the intermediate segments considerably narrower, more deeply cleft and with slenderer and more acuminate, more or less drooping points. The

whole *spadix* is about 1.50 m. long, composed of several (5) nearly equal partial inflorescences, which are separated from each other near the common base, and carry solitary panicles at the end of long slender peduncular parts. *Spathes* rigid, scantily covered with fugaceous, silvery or brownish paleae, and are finally almost glabrous. The panicles are about 30 cm. long, and twice branched; apparently only the uppermost of the 5 panicles carries fertile flowers; the floriferous branchlets are short and thickish, 5-6 cm. long, glabrous, terete, zigzag sinuous between the alternate rather distant flowers. The unopened *flowers* are narrow and relatively long (12-13 mm. long, 3.5 mm. through) bluntish often asymmetrical, calyx cyathiform-cylindrical, shortly 3-toothed, not or very obsoletely veined on the teeth of a hard texture, shortly solid at the base. Corolla twice or even a little longer than the calyx, the segments broadly sublinear, striate, staminal ring necklike, protruding considerably beyond the calyx; filaments rigid, radiating, anthers linear-sagittate, bluntish; ovary conical, not sculptured above, gradually narrowed into the thickish, 3-sulcate style. *Fruit* somewhat variable in shape, ranging from oval to spherical, apparently usually not quite symmetrical and with a slightly gibbous base, 3-3.5 cm. long, 2.5-3 cm. in diameter, made distinctly mucronate by the remains of the style; the surface is polished and black; mesocarp strongly fibrous; endocarp polished and cinnamon-brown inside, thinly woody. *Seed* spherical, 18-20 mm. in diam. *Fruiting perianth* depressed, and very shortly pedicelliform, 5 mm. broad, 2 mm. high.

Habitat.—It grows on the island of Hawaii about six miles in the forest, elevation 1100 m., in the forest near Glenwood, which lies 22 miles on the road to Kilauea Volcano. Collected by Rock and Copeland on December 23, 1914. (No. 10356 in the College of Hawaii Herbarium.)

Observations.—About this *Pritchardia* Professor Rock informs me that it is a beautiful palm of fine symmetry. The spadix has five main branches (in No. 10356) the four lower branches seem to be sterile and have spreading floriferous branchlets, while the last one is densely clustered, and the branchlets are very short and bear fertile flowers. It is a very distinct species, and very different from any other *Pritchardia* known to me. There are hundreds of them in the forests near Glenwood. The leaves resemble more those of *Pr. pacifica* than those of any Hawaiian species, and their upper sides are convex with shallow furrows, while the leaves of the other species are unevenly wavy, thus neither convex nor concave. The fruits of *Pr. Beccariana* seem to be extremely variable, and vary in size and shape, even on one and the same inflorescence, from globose to ovoid. Whether this variability has anything to do with certain insects which attack the fruits I am unable to say. *Pr. Beccariana* is especially characterized by: the tall stem and large leaves, the latter having the intermediate segments cleft into non-drooping apices, and sprinkled, but not very closely, on the lower surfaces with small hyaline, elliptical, fringed lepidia; by the spadices composed of 3-5 partial inflorescences, and having glabrous, floriferous branchlets; by the calyx being tubular-cylindraceous and of a hard texture; by the staminal ring protruding considerably above the calyx; by the conical not sculptured ovary, gradually pass-

ing into a thickish sulcate style; by the globose, rather large fruit, slightly asymmetrical at the base, distinctly mucronate, and with the mesocarp thickish, easily dissolving into coarse fibers.

Pritchardia Beccariana Rock var. **Giffardiana** Becc.

(Plate VII, *B*; fig. I, III a, b, c.)

Description.—A smaller plant than the type and with a shorter stem. The *flowers* also are a little smaller (11-12 mm. long) having the calyx a little shorter, and the nerves, converging to the teeth; rather distinct; the *fruit* is oblong, 3.5 cm. long, slightly excentrically mucronulate, and somewhat asymmetrical at the base.

Habitat.—This palm, according to the collector, Professor Rock, (No. 12709) comes from the region near the Volcano of Kilauea, Hawaii, and grows in the humid rain-forest at an elevation of 4200 feet (1270 m.) or about 2000 feet (600 m.) higher than *Pr. Beccariana*. It occurs on the land opposite Mr. Giffard's residence, some miles in the forest. At the request of Mr. Rock this variety is named after Mr. Giffard, who was instrumental in securing the specimens.

Observations.—Professor Rock says that this is a tall and stately palm, with large leaves, which do not, however, reach the enormous size of those of *Pr. Beccariana*. The trunk is tall and smooth, of a gray color with longitudinal slits, about 30-35 feet (9-10 m.) tall and about 1 foot (30 cm.) in diameter. The fruits are smaller than those of *P. Beccariana*. The spadix branches 3 times instead of 5 times, as is the case in the latter. Professor Rock supposes his No. 12709 to be a species distinct from *P. Beccariana* (No. 10356), but from the herbarium specimens at my disposal, I have not been able to discover any character by which it could be considered as an autonomous species. The flowers are perhaps a little smaller than in type, the ovary is a little shorter, but on the whole they offer quite the same characteristics. Professor Rock points out the peculiarity of the asymmetrical base of the fruit in his No. 12709, but the same occurs in the fruits of the typical *Pr. Beccariana* (No. 10356). A central portion of a leaf of No. 12709 measures 1.30 m. from the petiole to the end of the central segments; the latter are 5 cm. broad at their disjunction places, and are split at the apex for the extent of 25 cm. into two very acuminate, rigid, non-drooping points. The leaves in the herbarium specimens acquire, especially on the lower surface, a faint tawny color; the same occurs also in the *forma typica*.

18. **PRITCHARDIA ROCKIANA** Becc. in Webbia IV (1913), 228; f. 16; Rock, Indig. Trees Haw. Isls. (1913), 105.

(Plates V, *B;* XXI, *G*)

Description.—A small tree, 5 m. high, stem 30 cm. in diam. and of a gray color (Rock). *Leaves* large, the blade measures 1.15 m. from the ligula to the apex, and has the lower surface entirely clothed with a light yellow, nearly golden, very appressed and adherent tomentum composed of hyaline scale-like, much fringed and fetted lepidia; the segments are very deeply parted into two very long, gradually tapering, filiform points; the central segments are 4-4.5 cm. broad at their disjunction places. Petiole appressedly (not woolly) tomentose on the lower surface; and with the same kind of tomentum extending to the dorsum of the costae. *Spadix* composed of a rather diffuse thyrsoid panicle, about 20 cm. long, borne on a rather elongate peduncular part (40 cm. long in one specimen). *Spathes* tubular in their lower part and expanded above into a rather large lanceolate, acuminate ass's ear-like, very rigid, thinly coriaceous, scaly-furfuraceous blade; the naked peduncular part or rachis of the spadix is finely rusty tomentose, terete, 1 cm. through towards the base, and slightly flattened above. The panicle consists of a few, 2-3-partite branches in its lower part, and of simple floriferous branchlets elsewhere; the latter are finely rusty-tomentose, zigzag sinuous between the spirally alternate flowers, 8-12 cm. long, 2.5 mm. thick at the flowering time, or about 4 mm. thick when bearing the fruits. Floral bracteoles setaceous, very long. *Flowers* (unopened, and apparently not fully developed), elongate-ovoid, about 1 cm. long, and 4-4.5 mm. through near the base, narrowed above to a conical, obtusely trigonous, acute point; calyx glabrous, tubular and slightly ventricose, being broad and solid at the base, restrained a little at the mouth, and with 3 rather prominent, acute not veined teeth, and with a solid base. Corolla only one-third longer than the calyx (in the flowers at hand); the segments elongate triangular, acute, marked externally by 7 explanate ribs, separated by narrow furrows; staminal ring slightly protruding beyond the calyx; filaments filiform; anthers elongate-sagittate; ovary turbinate, strongly sculptured above, and conically narrowed into a trigonous, sulcate, thickish style; stigmas punctiform. The fructiferous panicle is recurved and has very spreading branches. Fruit large, obpyriform, rounded above and rendered distinctly apiculate by the remains of the abortive carpels, 5 cm. long and 3 cm through at about its upper third, and from thence gradually narrowed to a thickish base. The whole pericarp (dry) has walls about 4 mm. thick in the central and upper portions, but is entirely solid in its lower third portion; the dry mesocarp is grumous and permeated by many fine longitudinal fibers, and, apparently, is somewhat fleshy when fresh; endocarp woody, about two-thirds of a mm. thick, and prolonged below into a thick, obconical acute, woody tail; the seed cavity is slightly longer than broad (27 mm. long, 23 mm. broad) and occupies only the upper two-thirds of the fruit. *Seed* globose subovoid, with round vertex; hilum orbicular, 7-8 mm. in diam. *Fruiting perianth* shortly pedicelliform, 7-8 mm. broad.

Habitat.—Discovered by Professor Rock in August, 1911, at about 700 m. elevation in the rain forests of the northern slope of the Koolau range, Punaluu on Oahu.

Observations.—Easily distinguishable by the leaf blade being subaureous tomentose underneath; by the minutely rusty-tomentose floriferous branchlets, and especially by the large obpyriform fruit, which has its lower third part solid internally. The fruit represented in Webbia 1 c. fig. 16 is about one-tenth smaller than natural size.

19. **PRITCHARDIA HARDYI** Rock sp. n.

(Plates XIII, *A, B;* XXIV, *R*)

Description.—A palm 20 m. or more high, with a slender trunk 20 cm. or more in diameter; leaves larger than in *Pr. minor*, flexuous with drooping segments; leaf blade 100 cm. long from the ligule to the apex, coriaceous; lower surface densely tomentose with appressed light golden yellow, much fringed lepidia in the young and old leaves; segments 60, the central ones nearly 5 cm. wide at their disjunction places, parted about 35 cm. into two acuminate somewhat flexuous points, glabrous above with the exception of the upper costae which are covered with a silvery white coarse woolliness; ligule almost truncate. Petioles about 75 cm. long, about 3.5 cm. broad at the ligule, covered with a deep rufous deciduous tomentum as are the lower costae. *Spadix* long, drooping, branching into three distinct panicles, 2.26 m. long, 6.5 cm. broad at the base. Spathes long tubular in their lower part, expanded above into an elongate acuminate strongly chartaceous to coriaceous blade, which later becomes slashed; spadix and spathes covered with a detachable rufous tomentum; panicles covered with a short, not detachable rufous tomentum; branches simple, straight, erect, only the two lowest branches, branching again once or twice; branchlets zigzag-sinuous, 10 to 12 cm. long, when with fruit. *Flowers* spirally alternate, 11 to 12 cm. long when unopened, 3.5 cm. in diameter, oblong, apiculate; calyx cyathiform, puberulous, three-toothed, very inconspicuously striately veined and only immediately near the teeth; corolla longer than the calyx 6.5 mm. long, the segments oblong, bluntly acute, not prominently striate; staminal ring reddish, protruding 1.5 mm. beyond the calyx; the filaments subulate, 1.5 mm. long; anthers linear, 3 mm. long, broader at the base, slightly emarginate at the apex; ovary smooth, truncate at the apex, with a trigonous, sulcate style; stigmas punctiform. *Fruit* asymmetrical, ellipsoidal to obovoid, rounded at the apex but apiculate by the remains of the abortive carpels and at the ventral side somewhat flattened, black when ripe, striate, thickest in the upper third, 2 cm. long, 16 mm. thick; pericarp very thin, less than 1 mm. thick when dry; mesocarp very scanty; endocarp thin, pale yellowish, brittle. *Seed* ovoid 12 to 13 mm. long, 10 mm. wide, rounded at both ends, flattened on the raphe side; hilum irregularly ovoid; embryo 2 mm. above the hilum. *Fruiting perianth* cylindrical, truncate, with spreading staminal cap.

Habitat.—Kauai, on the Lihue side along the Pole Line Trail near Summit Camp, 1900 feet elevation, first observed by Mr. W. V. Hardy of the U. S. Hydrographic Survey; collected by J. F. Rock, January 30, 1920; flowering and fruiting type No. 17296 in the College of Hawaii Herbarium.

Observations.—A very handsome, and one of the tallest species, allied to *Pritchardia minor.* It is easily distinguished from both *Pr. eriophora* and *Pr. minor,* in the much larger crown, in the long drooping spadix which branches into three distinct panicles, and in the short non-detachable tomentum covering the actual panicles, which are simple branched; the flowers are longer than in either species, and the calyx is very inconspicuously striate and only at the very apex near the teeth, besides being puberulous. The fruit is smaller than in either of the other two described species from Kauai. Named for Mr. W. V. Hardy, who called my attention to this species.

20. **PRITCHARDIA MUNROII** Rock sp. n.

(Plates XIV, *A, B;* XXIV, *U*)

Description.—A palm about 4 to 5 m. tall including the crown, trunk gray, smooth and inconspicuously ringed; about 20 cm. in diameter. *Leaves* small, the blade measuring from ligule to apex 88 cm. in length, segments 70 in number, 4 to 5 cm. wide at their disjunction places, deeply divided (35 to 40 cm.) into long very acuminate drooping points with long filaments between the segments, pale green and glabrous above, the lower surface with scattered small elongate-elliptical, entire, hyaline lepidia; the lower costae on the under surface of the leaves densely covered with broad, long, many-nerved silky, pale fawn-colored translucent paleae; ligule triangular, apiculate; petiole 85 cm. long, 2.5 to 3 cm. wide at the apex, 14 cm. broad at the base, thick coriaceous, with long fibers along the margin densely covered beneath with a detachable, compact brown wool, glabrous above except in the young state when it is sparingly covered with a silvery white woolliness, as are also a few of the lower costae on the upper leaf surface in young leaves. *Spadix* 52 cm. long including the 12-13 cm. long panicle (fruiting stage), branching into two separate panicles, lower portion flat-compressed, about 4 to 4.5 cm. broad at the base, the peduncular part 8 mm. in diameter; flowering panicles 10 to 11 cm. long, enveloped by five ovoid, acute spathes, more than 12 cm. broad, 20 cm. long, the tubular portion twice as long or longer, glabrous when old but with a grayish detachable scattered wool towards the apex; flowering panicle 10 to 11 cm. long with numerous branchlets, simple branched above, the lower ones dividing into six branchlets; branchlets 3 to 4.5 cm. long when with flower, 6 cm. long when with fruit, erect or vermiformly twisted and covered throughout with a dirty grayish brown tomentum, somewhat angular and marked with conspicuously spirally alternate notches for the insertion of the flowers. *Flowers* (unopened) 7 mm. long, 3 mm. in diameter in their median part; calyx glabrous, strongly striate, wider at the apex, narrowing towards the base, the latter oblique; calycine teeth very short, bluntly acute and broadly triangular; corolla segments elongate oblong, striate, nearly 5 mm. long, 1 to nearly 2 mm. broad and narrower at the base; staminal ring not protruding beyond the

calyx; anthers sagittate; ovary turbinate, conically narrowing into a sulcate style. *Fruit* subspherical, glossy, yellowish to grayish brown when mature, 22 mm. long, 20 mm. broad, somewhat truncate at the base, with one or two more or less pronounced ridges; mesocarp deep black, nearly 3 mm. in diameter, grumose and accompanied by several strong stiff fibers; endocarp hard woody 0.5 mm. in diam. *Seed* ovoid, the apex slightly pointed with wart-like protuberance, otherwise rounded, yellowish brown in color and marked with paler streaks, about 13 mm. long, 10 to 11 mm. in diameter. Hilum large, oblong; embryo not far from the upper raphe margin. *Fruiting perianth* missing.

Habitat.—Molokai, leeward side, at an elevation of 2000 ft. above Kamalo and near or at Puakoolau, in a dry gulch, associated with *Xanthoxylum mauiense, Dodonaea stenoptera, D. viscosa, Sida, Maba sandwicensis, Dracaena aurea,* etc.

Observations.—A very remarkable species, easily distinguished by the very small panicles which are densely covered with dirty grayish brown hair and by the small subglobose fruits which resemble those of *Pritchardia remota* Becc. The leaves of *Pritchardia Munroii* Rock are covered in the lower portion, especially on the costae of the under surface, with large and broad translucent paleae which are larger than in any other species known. It is the only species with globose to subglobose fruits and densely woolly panicles; the fruits alone resemble those of the *Pritchardia remota,* or *Pr. affinis.* The species is named for Mr. James Munro, manager of the Molokai Ranch, who is an ardent and keen supporter of the natural sciences, and to whom the writer is indebted for many kindnesses. The species was discovered February 20, 1920, Mr. Munro and Mrs. L. M. Dunbar being present: Rock No. 17342, type in the College of Hawaii Herbarium. The species has also been under cultivation on Molokai at the home of Mr. O. Meyer at Kalae; here a plant from which specimens were collected has been growing for many years, but has a trunk only about 2 feet in height: Rock No. 17341 in the College of Hawaii Herbarium.

21. **PRITCHARDIA ARECINA** Becc. in Webbia, IV (1913) 224 f. 14; Rock, f. 14; Rock, Indig. Trees Haw. Isls. 107.

(Plates XV, *A;* XX, *D*)

Description.—One of the largest. Stem 10-12 m. high and 50 cm. (or less ?) in diam. *Leaf blade* 1.30 m. long from the ligula to apex, and parted to above the middle into about 60 segments; the lower surface is entirely clothed with a light yellow, nearly golden adherent tomentum, composed of hyaline, scale-like, much fringed and felted lepidia; the segments are very deeply parted into two very long laciniae which taper very gradually to filiform apices; the central segments are 5-6 cm. broad at their disjunction places. Petioles stout and broad (4.5-5 cm. broad at apex), covered on the lower surface with a fulvous, more or less removable tomentum, which extends to the dorsum of the costae; ligula short, crescent like, distinctly apiculate. *Spadices* elongate, composed of an ovate thyrsoid panicle, about 20 cm. long, borne on a very long terete peduncular part,

which in one specimen is 1.15 m. long, and, when sheathed by its several tubular spathes, is 2.5 cm. through; the spathes are lacerate in their upper part, and more or less clothed with a fuscous woolly tomentum; the rachis or naked peduncular part of the spadix is 15 mm. in diam. and very densely woolly tomentose; the upper spathes embrace nearly completely the panicle, and have a concave ass's ear-like acuminate, thinly coriaceous, more or less permanently tomentose, finally slashed blade. The *flowering panicle* is erect, slightly shorter than the spathes, rather dense, composed of a few 2-4 partite branches in its lower part, and of simple floriferous branchlets elsewhere; the latter are 8-12 cm. long, relatively thick (about 5 mm. through), permanently clothed with a very dense tomentum of short yellowish hairs, are somewhat angular, and marked with rather deep, irregularly spirally alternate notches for the insertion of the flowers; bractioles inconspicuous (deciduous ?). *Flowers* relatively large, 12-14 mm. long (when unopened) and 5-6 mm. through in their lower part, slightly narrowed above to a conical, obtusely trigonous, subacute point; calyx hairy-woolly, cyathiform, campanulate with three small acute teeth; corolla more than twice as long as the calyx, the segments elongate-triangular, acute, obsoletely striate; staminal ring very short, not protruding above the calyx; filaments subulate from broad bases; anthers narrow, elongate, distinctly two-auricled, sagittate at the base; ovary turbinate, strongly sculptured above, suddenly narrowed into an elongate, subulate, acutely 3-gonous style; stigmas punctiform. *Fruit* large, not very regularly globose ovoid, 4.5 cm. long, 38-40 mm. through, rounded at both ends, and conspicuously apiculate by the remains of the abortive carpels; the surface (in the dry fruit) is nearly polished, and of a very dark brown color; whole pericarp 6-7 mm. thick; the mesocarp is traversed by numerous, very fine, soft, longitudinal fibers, which at complete maturity separate from each other, especially at the base; endocarp woody, thin and brittle, one-half to two-thirds of a mm. thick, prolonged at the base into a woody obconical, very acute base; endocarpal cavity 22-25 mm. in diameter. *Seed* globose-ovoid, somewhat longer than broad, distinctly conically apiculate; hilum orbicular. *Fruiting perianth* slightly accrescent, thickish, pedicelliform, 8 mm. through.

Habitat.—Discovered by J. F. Rock, May, 1911, on the northern slope of Mt. Haleakala on the island of Maui, in dense swampy forest above Honomanu, at about 1000 m. elevation (Rock No. 8821). Rock writes (l. c.) that "one single tall specimen was also observed above Nahiku, on the same mountain at 4000 ft. (1200 m.) elevation along a stream bed."

Observations.—A very fine, large and distinct species, not likely to be confounded with any other, characterized by the leaf blade which is covered on the lower surface with an adherent light-yellow nearly golden tomentum; by the densely hairy-tomentose floriferous branchlets; by the hairy calyx; and by the large globose-ovoid fruit having the mesocarp dissolved, at perfect maturity, especially at the base, into fine soft fibers exactly as in the fruit of *Areca Catechu*, the fruit of which is very similar in size and shape to that of *Pr. arccina*. It approaches *Pr. lanigera* and *Pr. eriostachya* in its densely hairy floriferous branchlets, but these latter have the calyx glabrous, whereas it is distinctly hairy

woolly in *Pr. arecina;* moreover in this latter the floriferous branchlets are clothed with a short dense tomentum, whereas the tomentum in *Pr. lanigera* as in *Pr. eriostachya* is composed of ruffled hairs.

22. **PRITCHARDIA MONTIS-KEA** Rock sp. n.

(Plates XVI, *A, B;* XX, *C*)

Description.—Palm 5 to 8 m. tall; trunk gray, smooth 20 to 25 cm. in diameter. *Leaves* wider than long, consisting of 70 segments; length of blade 93 cm. from ligule to apex, width of frond 150 cm. widest portion; thick, coriaceous, of a rich green color, glabrous, above, and glossy, with small, hyaline, slightly fringed, elongate elliptical lepidia scattered beneath, especially so in the young frond; width of central segments at their disjunction places 5.55 cm., parted about 20 cm. into acuminate non-drooping points; lower costae covered on both sides with a silvery to ash-gray tomentum; ligule crescent-shaped, not apiculate, rounded and irregular; petiole 65 cm. long, 4.5 cm. wide at ligule; 6.25 cm. wide at the base, slightly floccose but later glabrous; filaments present between segments of young leaves, but absent in old leaves. *Spadix* branching into three distinct panicles at equal intervals; whole spadix 105 cm. long, 4 cm. wide at the base; main peduncle 12 mm. wide; spathes 30 cm. long including the 10 cm. long tubular portion, ovate, acuminate, strongly concave, with fawn to pinkish colored tomentum which turns grayish when old; flowering panicle 10 cm. long, the branches thick and short, 5.5 to 6 cm. long, simple in the upper part, the lower branching into three branchlets, covered densely with a reddish brown to fawn-colored silky wool on all its parts; fruiting panicle larger, 20 cm. long, with horizontally spreading branches, the lower twice branching; branchlets nearly 1 cm. in diameter at the base, about 8 cm. long, and covered with the dense silky persistent wool. *Flowers* (unopened) 11 mm. long, arranged spirally and inserted on circular projecting tubercles; calyx urceolate, broader at the base, 6 mm. long, 5 mm. through at the base, pubescent with fawn-colored hair and ciliate at the apex along the margin between the broadly acute teeth, the latter also ciliate, not at all striate; corolla segments 6 mm. long, 3 mm. wide at the base, not striate outside but marked with darker streaks, otherwise smooth; staminal ring projecting 1 mm. above the calyx; filaments setiform; anthers linear, broader at the base; ovary turbinate but truncate or rounded at the base, conically narrowed into a thick yellow glossy style; stigmas punctiform. *Fruit* elliptical oblong in outline when young, with long style and sterile carpels; when mature, black and shining, 5 to 5.5 cm. long, 4 cm. wide, obovate, rounded at the apex, asymmetrical at the base (measurements not including the perianth); pericarp thin, 1 mm.; mesocarp traversed by numerous fine sinuous branched fibres; endocarp hard, woody, dark brown. *Seed* ovoid, distinctly pointed at the apex, broadest at the base, 3.5 cm. long, 27 mm. broad, embryo quite distant from the hilum (10 mm.) and situated on the upper surface of the seed. *Fruiting perianth* constricted at the throat, 5.5 cm. broad, 5 mm. high.

Habitat.—This species inhabits the windward slopes of Mauna Kea, the highest mountain in the Pacific, on the island of Hawaii at an elevation of 2000 to

3000 feet below Mana between Honokaa and Paauhau. The forest in this region has been practically destroyed; only a few individuals have survived. Now they are lone sentinels in open meadow land. It was discovered on March 17, 1920. The type is Rock No. 17348 in the College of Hawaii Herbarium.

Observations.—A species closely related to *Pritchardia eriostachya* Becc. but differing from it mainly in the very large fruits which are nearly the size of those of *Pritchardia Lowreyana* Rock, in the pubescent and ciliate flowers, in the larger panicle with thick stout horizontal branches. The woolliness is exactly as in *Pritchardia eriostachya* Becc. but of a fawn-color instead of salmon color. The spadix branches into three panicles instead of being simple. The leaves are not covered with nearly confluent lepidia, but the lower surface is dotted with elongate, slightly fringed, distantly spaced, hyaline lepidia, giving it an almost glabrous appearance. The fruits of this species are the second largest in size in the genus. The densely packed short panicle resembles more that of *Pritchardia lanigera,* but the hairiness of the panicle is different.

23. PRITCHARDIA VISCOSA Rock sp. n.

(Plates XV, *B;* XXIII, *N*)

Description.—A medium-sized palm, trunk 6-8 m. high, 45 cm. in diameter. *Leaves* large, of the size of those of *Pritchardia Hardyi,* stiff; leaf blade 100 cm. long from the ligule to the apex, coriaceous, the lower surface densely tomentose with appressed, greenish white, much fringed, contiguous lepidia; segments 60, the central ones 5 cm. wide at their place of disjunction, parted about 24 cm. into two, broad and bluntly acute points, glabrous above, pale green, the lower costae covered with a dirty greyish wool; ligule crescent-shaped, strongly apiculate; petioles 88 cm. long, 3.5 cm. wide near the ligule, 11 cm. broad at the base, covered beneath, in the lower half, with a dark rufous cottony substance. *Spadix* branching into three distinct panicles about 1 m. long, 4 cm. wide at the base; main peduncles 1 cm. in diameter; spathes tubular at the base, glabrous inside, and densely covered with a coarse reddish brown tomentum, turning whitish towards the apex of the spathes; panicle simple branched with erect terete branchlets, only the two lower branchlets again branching once or twice. Panicles about 15 cm. long from the branching base to the apex of the upper branchlets, coarsely yellowish white villose; floriferous branchlets 10 to 11 cm. long, viscous, strongly sinuate between the spirally alternate flowers, 2 to 3 mm. thick; bracteoles very short, subulate. *Flowers* (unopened) thickly viscous, shining as if varnished, 10 to 11 mm. long; calyx angular, broadest at the base and solid, 5 mm. wide, nearly 7 mm. long, urceolate, narrowing towards the apex, not at all striate, the points short and sharp. Corolla shorter than the calyx, at least in the bud, the segments linear-oblong, 7 to 8 mm. long, 3 mm. wide, acute at the apex, inconspicuously ribbed; staminal ring protruding slightly beyond the calyx; filaments filiform, broader at the base; anthers attached at their lower third, elongate; ovary subtruncate; style sulcate and viscous; stigmas punctiform. Fruit ellipsoid-pear-shaped, large, nearly 4 cm. long, 2.5 cm. in diameter, rounded above, but sharply apiculate by the remains of the abortive carpels, thickest in the upper third, thence narrowing to a thickish base; pericarp 2.5 mm. thick, the basal part

solid; mesocarp permeated by many fibers; endocarp very thin, yellowish-white, shining. *Seed* ovoid, acute at the apex, the hilum oblong. *Fruiting perianth,* constricted at the apex; staminal ring and filaments persistent, spreading, 7 mm. broad.

Habitat.—Kauai, one mile north of Summit Camp and two miles east of Pole Line Trail, elevation 2000 feet, in Kalihiwai Valley, windward side of the island; flowering and fruiting, January, 1920. Rock No. 17295; type in the College of Hawaii Herbarium.

Observations.—A very distinct species, and the only one with a decidedly viscous inflorescence, calyx, and corolla. In the branching of the panicle it resembles *Pritchardia Hardyi;* but the spadix is much shorter. The flowers resemble those of *Pr. Rockiana,* while the fruits are quite singular, being ellipsoid-pear-shaped. The other three species now known from Kauai are closely related, while the present one, the fourth so far known from that island, stands quite by itself; it is one of the most interesting species so far found in these islands, although it is related to *Pr. Rockiana.*

24. **PRITCHARDIA LANIGERA** Becc. Malesia, III, 298, t. XXXVIII. f. 1-3; and in Webbia II. (1907) 203; and IV (1913), 209, 231; Rock, Indig. Trees Haw. Isls. (1913) 103, Pl. 32.

Pr. Gaudichaudii (non H. Wendl.) Hillebr. Fl. Haw. Isls. (1888) 450 (in part).

Washingtonia lanigera O. Kuntze, Rev. Gen. Pl. II (1891) 737.

Eupritchardia lanigera O. Kuntze, Rev. Gen. Pl. III. 2 (1898) 323.

(Plate XVII, *A*)

Description.—It is a rather robust palm with a very straight trunk, about 5 m. high and from 30 to 50 cm. in diameter, and with a beautiful head of large leaves. The *leaf blade* measures about 1 m. from the ligula to the apex, is of a thickish and tough structure; its lower surface looks glabrous, but, in fact, is closely dotted with small, appressed, orbicular or oblong, scale-like lepidia; the central segments are about 6 cm. broad at their disjunction places, and are parted, not very deeply into two gradually, finely acuminate, rigid (non-drooping) points. Petioles about as long as the blades, covered (apparently on both surfaces) with a copious floccose, grayish, amianth-like, indumentum, which extends to the base of the blades. *Spadices* apparenlty shorter than the petioles (in one specimen, perhaps not entire, about 40 cm. long) composed of a small panicle borne on a rather short, outwardly curved, peduncular part; the spathes are covered with the same kind of tomentum (more or less deciduous by age) as the petioles, are tubular in their basal part, and expand above into a lanceolate boat-shaped, acuminate, rigid chartaceous blade, which envelopes completely the panicle. The *flowering panicle* is ovate-thyrsoid, 10-12 cm. long, slightly shorter than the spathes, dense, composed of a few 2-3 partite branches in its lower part, and of simple floriferous branchlets elsewhere; the latter are 4-8 cm. long, relatively

thick, about 4-5 mm. through, permanently clothed with a dense tomentum of rather long, ruffled, light-colored hairs, are somewhat angular and sinuous and marked with rather conspicuous, irregularly spirally alternate notches for the insertion of the flowers. The bracteole existing at the base of every flower is inconspicuous, being hidden by hair. *Flowers* (unopened) 10-11 mm. long, 4-5.5 mm. through in their lower part, slightly narrowed above to a conical, obtusely trigonous, acute point; calyx glabrous subovate urceolate, not veined, of a thickish hard structure, shortly solid at the base, slightly restrained at the mouth, and with 3 rather acute teeth; corolla not quite twice as long as the calyx, the segments elongate-triangular, acute, marked externally by 7 explanate ribs separated by narrow furrows; staminal ring slightly protruding beyond the calyx; filaments subulate from a broad base, remaining erect after the anthesis; anthers linear-sagittate; ovary turbinate, strongly sculptured above, and conically narrowed into a trigonous, sulcate, thickish style. *Fruit* apparently ovoid and relatively large (not seen mature).

Habitat.—First discovered by Mr. J. Lydgate on the Kohala Ridge on the island of Hawaii; collected again July, 1910, by Professor Rock (with flowers only) in the classical locality, above Awini, at about 1000 m. elevation, in a dense tropical rain forest (Rock No. 8820).

Observations.—In the densely hirsute floriferous branchlets it approaches *Pr. arecina* and *Pr. eriostachya.* From the first it differs in the leaf blade which is apparently glabrous underneath, but sprinkled really with minute, punctiform lepidia; whereas in *Pr. arecina,* the lower surface is appressedly subaureous-tomentose, and in *Pr. eriostachya,* is covered with relatively large, hyaline, nearly confluent, scale-like lepidia.

Lydgate's specimen, which fixes the type, is accompanied in the Berlin Herbarium by two immature fruits, ovoid, acute, about 3 cm. long, and 18-19 mm. through.

Note by Joseph F. Rock.

Pritchardia lanigera Becc. has been found by me in the mountains back of Waimea, Hawaii, on the flat swampy plateau at an elevation of about 4000 feet; there it is a palm with a stout trunk and very rigid leaves with non-drooping segments; the spadix is usually simple, but only in one instance did I come across a second very small panicle developed. The mature fruits of *Pr. lanigera* Becc. are as yet unknown, but from old remnants of fruits found on the ground beneath the palms, and from germinated, and growing ones it can be seen that they are not so large as those of *Pr. montis-kea* Rock, to which the species is also related. *Pritchardia lanigera* is evidently scattered throughout the Kohala mountains; on the high plateau back of Waimea it grows among stunted bog vegetation in sphagnum moss, with *Metrosideros, Clermontia parviflora, Broussaisia,* etc. The trunk is usually not more than 20 feet in height. Unfortunately only one of the many palms of this species examined had flowering panicles and

one had three green fruits adhering to an otherwise bare panicle. The largest of these fruits is obovoid, about 28 mm. long and about 20 mm. in diameter; the seed was still soft and easily cut, showing that the fruit was quite immature. Rock No. 17349 in the College of Hawaii Herbarium.

25. **PRITCHARDIA ERIOSTACHYA** Becc. in Webbia, IV. (1913) 209, 232; Rock, Indig. Trees Haw. Isls. (1913) 107, Pl. 33.

(Plates XVII, *B;* XXII, *I*)

Description.—A small tree, 6 to 7 m. high with a gray smooth trunk of 15 to 20 cm. in diameter (Rock). *Leaf blade* about 1 m. long from the ligula to the apex, of a thickish, rather coriaceous structure, subtomentose underneath from nearly confluent, hyaline, scale like, ciliate fringed lepidia; the lower costae also tomentose, at least near the base; central segments relatively short, 6 cm. broad at their disjunction places, and parted for the extent of about 10 cm. into two acuminate rigid points. Petioles, 75 cm. to 1 m. long, robust; ligula rounded, oblong. *Spadices* over 1 m. long, composed of a relatively small panicle at the end of a rather thick peduncular part. The spathes are clothed all over with a dense, rufous, nearly salmon-colored wool, are tubular in their lower part, and expand above into a lanceolate-acuminate ass's ear-like, chartaceous blade. The rachis and the panicle are also densely clothed with rufous wool; the panicle protrudes a little beyond the apices of the spathes, is erect during the anthesis, dense, ovate-thyrsoid, 20-25 cm. long, and has a few short 3-4 partite branches in its basal part, and simple floriferous branchlets in the remainder; branchlets fastigiate, 6-7 cm. long, appearing thick from the dense wool with which they are covered, 6-7 mm. thick at the base, tapering above to acute apices, are slightly sinuous between the flowers which are spirally inserted all around on small projecting tubercles. Floral bracts broad and scarious at the base, with a long setiform, finally obsolete tip. *Flowers* (unopened) 10-11 mm. long; calyx cylindraceous, of a hard nearly woody texture, very shortly 3-toothed, 5 mm. long, 4 mm. through at the base, which is solid internally and excavate below, obsoletely veined only towards the teeth; corolla twice as long as the calyx, narrowed above and subacute; the segments very obsoletely marked by 6-7 narrow striae; staminal ring slightly projecting above the calyx; filaments setiform from a broad base; anthers linear-sagittate, blunt; ovary turbinate, deeply sculptured above, conically narrowed into a trigonous sulcate, thickish style; stigmas punctiform. The *fruit,* when still young, is obovate, rounded above, and apiculate from the rather conspicuous remains of the sterile carpels and style; it narrows from about the middle to a rather acute base; when thoroughly mature, it is ovoid-elliptical, or slightly obovoid, 3.5-4 cm. long (including the perianth), and 26-28 mm. through; the whole pericarp is 2.5-3 mm. thick, thicker at the base; mesocarp grumous, traversed by extremely fine fibers; endocarp very thinly woody, brittle. *Seed* very broadly ovoid, rounded at both ends. *Fruiting perianth* callous, depressedly pedicelliform, 6 mm. broad, 4 mm. high.

Habitat.—Discovered in January, 1912, by Professor Rock on Hawaii, on the southern slopes of the active volcano, Mauna Loa, and in the dense rain

forests of Naalehu, district of Kau, at an elevation of about 1000 m. (Rock No. 10004).

Observations.—A species very distinct by the copious and peculiarly colored wool that covers every part of the spadix (rachis, spathes, and floriferous branchlets); by the leaf-blade closely scaly-subtomentose underneath, with the segments not deeply parted into two short acuminate, non-drooping points; by the panicle having fastigiate thickish, woolly floriferous branchlets, and carried on a rather long and thick, peduncular part; and by the rather large ovoid fruit. It is not closely related to any other species, although resembling *P. lanigera* and *P. arecina,* in the dense hairy covering of the floriferous branchlets. The fruit represented in Webbia l. c. fig. 17 *a-b* had not yet acquired its complete development.

26. **PRITCHARDIA ERIOPHORA** Becc. in Webbia, IV. (1913) 209, 235 f. 17 *c, d.;* Rock, Indig. Trees Haw. Isls. (1913) 105.

(Plates XVIII, *A, B;* XXIII, *Q*)

Description.—A palm 12 m. or more high with a slender trunk (Rock). Leaves small; leaf blade (in one specimen) 45 cm. long from the ligula to the apex, of a thickish, rather coriaceous structure; the lower surface tomentose from confluent, appressed, much fringed lepidia, of a light yellow, nearly golden, color in newly expanded leaves, grayish in the old ones; the segments, apparently are not very numerous (perhaps about 45); the central ones, 3.5 cm. broad at their disjunction places, deeply parted into two acuminate, rigid, nearly pungent points. Petioles short, about as long or even a little shorter than the blades. *Spadix* relatively short, 40-45 cm. long; spathes tubular in their lower part, and gradually expanded above into an elongate, lanceolate, acuminate, ass's ear-like, at first rigid-chartaceous, but later slashed blade; every part of the spadix, spathes and panicle is, like the petioles, very densely and copiously covered with a compact mass of very soft, rufous, cottony hairiness; the panicle is short, twice branched in its lower part and simply branched above, erect at first, and with branches and flowers almost hidden by the peculiar, very dense, fluffy clothing described above; when fructiferous, the panicle is recurved; the branchlets in age remain partially denuded and appear 2-5 cm. long, slender, 1-1.5 mm. through, zigzag sinuous. *Flowers* spirally alternate, seated on small projecting tubercles; when unopened, are 8-8.5 mm. long, 4 mm. through, oblong, not narrowed above, and obtusely apiculate; calyx cyathiform-campanulate, distinctly striately veined, glabrous, 3-toothed, the small teeth slightly hairy penicillate at apex; corolla twice as long as the calyx, the segments oblong subrectangular or with nearly parallel sides, strongly striate-costulate outside; staminal ring somewhat protruding beyond the calyx; filaments subulate from slightly broadened bases; anthers linear-oblong, rounded at apex; ovary turbinate, strongly sculptured above, and conically narrowed into a trigonous, sulcate, thickish style; stigmata punctiform. *Fruit* usually slightly asymmetrical, narrowly elliptical or thickly fusiform and subacuminate, being widest in the middle and tapering, about equally, in both directions, acute at the base, and apiculate by the remains of the abortive carpels and style; when mature, shiny black, 2.5-3 cm. long, 12-13 mm.

through; whole pericarp 1.5 mm. thick (dry) somewhat thicker at both ends, especially at the base; mesocarp very scanty, and with several longitudinal fibers; endocarp thinly woody, brittle. *Seed*, ovoid, 15 mm. long, 9 mm. through, conical and rather acute at apex, slightly more convex near the raphe than on the opposite side, marked at about the middle of the lateral faces with only one vascular branch of the raphe; hilum elliptical; integument slightly thickened on the raphe side; embryo nearly basal. *Fruiting perianth* campanulate, with the tube of the corolla and staminal ring persistent, and with the remains of the filaments erect.

Habitat.—Discovered in the year 1911 by Mr. Gerrit P. Wilder in the forest swamps of Halemanu in the central plateau of the island of Kauai. Professor Rock sent me the specimens from which the description above is derived (Rock No. 8846).

The typical *Pritchardia criophora* Becc. was collected by Professor Rock when in company with Mr. Eric Knudsen and Mr. H. P. Agee, on the highest ridge, called Kaunuohua, near Kalalau, Kauai, at an elevation of 4200 feet; several individuals were observed, and the tallest one, measuring about 45 feet in height, was photographed: Rock No. 17319 in the College of Hawaii Herbarium.

Observations.—One of the smallest species, but very characteristic, allied only to *Pr. minor*. It is distinguishable by the leaf blade, which is subaureous tomentose underneath; by the very abundant soft, fulvous, cottony tomentum that covers every part of the spadix; by the small panicles having primary branches divided into short floriferous slender branchlets, also very densely clothed with the same peculiar hair that covers the spathes and rachis, but deciduous in age; by the rather small flowers with cyathiform-campanulate, strongly striately-veined calyx; and by the small ellipsoidal subfusiform, conically acuminate fruit.

The fruit of this species represented in Webbia l. c. fig. 17, *c, d* is one-tenth smaller than natural size. From *Pr. minor* it differs especially in the smaller panicle, with less densely flowered and shorter floriferous branchlets, and in the shape of the fruit.

27. **PRITCHARDIA MINOR** Becc. in Webbia, III. (1910) 137, and IV. (1913) 210, 238, f. 17 e. f. g.; Rock, Indig. Trees Haw. Isls. (1913) 104.

(Plates XIX; XXIV, *S*)

Description.—Apparently of the dimensions of *Pr. criophora*, but with somewhat larger leaves. *Leaf blade* 60-85 cm. long from the ligula to the apex, clothed underneath with a rather soft, gray-yellowish or nearly golden tomentum, composed of not very appressed, yet much fringed lepidia, central segments up to 6 cm. broad at their disjunction places, parted to the extent of 15-25 cm. into two very gradually acuminate, rigid points. Petiole apparently about as long as the blade, very densely cottony-tomentose on both sides. *Spadices* composed of

a rather large panicle, which is borne on an apparently short, peduncular part; the spathes are, as usual, tubular in their lower portion, and expand above into a lanceolate, very long, acuminate, rigid-chartaceous blade, and are very copiously clothed with a very soft, rufous wool; the rachis of the spadix and all branches of the panicle are also clothed with a similar wool, which, however, is partly deciduous in age. The fructiferous panicle (in one specimen) is about 30 cm. long. nearly twice branched in its lower part, and simply branched at apex only; the lower primary branches divide in as many as 10-12 secondary branches, of which the lowermost are again 2-3 partite; fructiferous branchlets 4-7 cm. long, when denuded by age of their cottony clothing are 1.5 mm. through at the base, terete, subtorulose and closely sinuous between the rather closely, spirally set flower-pulvinuli. *Flowers* apparently small, but none are available for dissection in the specimens at hand. *Fruit* ovoid-ellipsoidal or obovoid, 10-20 mm. long, 12-13 mm. through, somewhat narrowed, usually slightly sigmoidally, to the base, rounded above and apiculate, frequently obliquely, by the small remains of the abortive carpels and style; whole pericarp about 1 mm. thick; mesocarp very scanty, with a layer of rather broad fibers in its inner part; endocarp hard, relatively thick and with a short and broad obconical, acute base. *Seed* regularly ovate, rounded at both ends, 12 mm. long, 6 mm. broad. *Fruiting perianth* shortly pedicelliform-campanulate, with the tube of the corolla and the staminal ring spreading.

Habitat.—The fruits upon which this species was based were collected in March, 1909, by Professor Rock on Kauai in the swampy forest near Alakai, back of Halemanu. Leafy specimens with fruits, quite similar to those that represent the type, were collected again on Kauai, also by Rock, in October, 1911, in the forests of Kaholuamanu.

Observations.—I have derived the description above from the specimens collected at Kaholuamanu, but in regard to its fruits I have not noticed any difference from the typical ones from Halemanu. However, Professor Rock observes that the palm from Halemanu was quite 20-30 feet, (6-9 m.) in height, with a slender stem of about 10 cm. in diameter, and that the palm from Kaholuamanu had a shorter and thicker trunk, and the whole plant had not the slender aspect of that from Halemanu. *Pr. minor* has, like *Pr. eriophora,* the leaf blade subaureous-tomentose underneath, and the similarly copious, soft woolly clothing, on every part of the spadix; it is distinguishable, however, by its larger and more branched panicle, with longer and more robust terete-subtorulose, floriferous branchlets, which have the flowers rather closely spirally arranged around them; and by the small ovate or subovate fruit. The fruits of this species represented in Webbia l. c. fig. *e, f, g,* are about one-tenth smaller than natural size. Fig. *e* represents the fruit of the type from Halemanu and figs. *f, g* from Kaholuamanu.

28. **PRITCHARDIA VUYLSTEKEANA** H. Wendl. in Revue Hort. 1883, 329 f. 59 (young plants); Gard. Chr. 1883 XIX. 693, f. 14; Becc. Malesia, III. 291; in Webbia II. (1907) 202 and IV. (1913) 216.

Washingtonia Vuylstekeana O. Kuntze, Rev. Gen. Pl. II. (1891) 737.
Eupritchardia Vuylstekeana O. Kuntze, Rev. Gen. Pl. III. (1898) 323.

Description.—*Fruit* oblong, 24 mm. long, and 20 mm. through, terminated by the slightly excentrical remains of the abortive carpels. *Seed* 14 x 15 mm. The *leaf* from a plant cultivated at Herrenhausen has the blade one-third of a circle in outline, parted into about 50 segments; it is quite glabrous, and devoid of lepidia on the lower surface; the lower costae are also glabrous.

Habitat.—The nearly inaccessible islands of the Dangerous or Low Archipelago (Paumotu or Tuamotu) in oriental Polynesia. The first mention of this palm appeared in a notice of the horticultural establishment of Ch. Vuylsteke at Loochristi, near Ghent in Belgium.

It is cultivated in the hot houses of some gardens.

29. **PRITCHARDIA PERICULARUM** H. Wendl. in Horto Vuylstek; Revue Hort. 1883, 206; Becc. Malesia III. 292; in Webbia II. (1907) 202 and IV (1913) 217.

Washingtonia pericularum O. Kuntze, Rev. Gen. Pl. II. (1891) 737.
Eupritchardia pericularum O. Kuntze, Rev. Gen. Pl. III. (1898) 323.

Description.—Fruit nearly spherical, a little smaller than that of *Pr. Vuylstekeana*, 20 mm. long, and 18 mm. through, terminated by the excentrical remains of the sterile carpels and style. Seed 12 x 13 mm. The leaves from plants cultivated at Herrenhausen are similar to those of *Pr. Vuylstekeana*, are quite glabrous, and devoid of lepidia on the lower surface.

Habitat.—With the preceding in the Dangerous Archipelago.

30. **PRITCHARDIA WRIGHTII** Becc. in Webbia, II. (1907) 203; in Pomona Journ. of Econ. Botany, III. Feb. 1913, 398, f. 160, 161, 162.

Colpothrinax Wrightii Gris. et Wendl. in Pl. Cub. Wright No. 3964; H. Wendl. in Kerch. Palm, 241; Sauv. Fl. Cub. No. 2382.

(Plate I, *B*; fig. 1, I a, b, c.)

Description.—A very curious palm with a trunk 10-12 m. high, smaller, and bottle shaped in its lower part or toward the middle, and very slender and cylindrical above. *Leaves* large; blade suborbicular in outline, broadly cuneate at the base, 1.50 m. long from the ligula to the apex, parted regularly nearly to the middle into very numerous segments (about 80 in one specimen), glossy above, finely and very appressedly tomentose underneath; the lower main costae equally tomentose; the tomentum is easily removable, and the surface appears then distinctly dotted with glandiform bodies, which, apparently, are the bases of the trichomes of which the tomentum is made; secondary nerves numerous; transverse veinlets obsolete; the lateral segments are deeply bifid, and the divisions gradually acuminate; the central segments are 3-3.5 cm. broad at their disjunction places, and biparted at apex to the extent of 3-5 cm. only. Petioles about as long as the blade, robust, 4 cm. broad at apex; ligula, thinly coriaceous, brittle,

crenate; rachis narrow, somewhat produced into the blade. *Spadices* short, composed of a loose panicle 20-25 cm. long at the end of an about as long or perhaps longer peduncular part; upper spathes (only two present in the specimen at hand) tubular in their lower part, expanded above into a concave ass's ear-like, lanceolate, acuminate, thinly coriaceous, rigid, outside, appressedly rusty, tomentose blade; the panicle at time of anthesis is spreading, or curved, and thrust out of the spathes; it has the rachis finely rusty tomentose, but is finally glabrous, and is loosely divided into few very spreading branches, of which the lower are 3-4 partite, and the upper simple; floriferous branchlets 12-16 mm. long, 2-3 mm. thick at the base, narrowed above, and subulate at apex, subterete, and nearly straight, being only very slightly sinuous between the floral pulvinuli, the latter superficial, furnished with a very minute subulate bract. *Flowers* irregularly spirally inserted in the lower part of the branchlets, alternate and subbifarious above, apparently somewhat fleshy, small, 7 mm. long (unopened) and 2-5 mm. broad at the base, and narrowed above to a rather acute apex; calyx cyathiform-campanulate, tricostulate-subtrigonous, of a fleshy subcoriaceous structure, internally solid at the base, and with three minute teeth at the otherwise truncate mouth; corolla twice as long as the calyx, the segments semi-ovate-triangular, acute, inserted just outside the mouth of the calyx, spreading during the anthesis, and soon deciduous; staminal ring, protruding above the calyx, crowned by six narrowly-triangular, acuminate filaments; anthers linear-sagittate, obtuse and slightly emarginate at apex; ovary turbinate, sculptured above and rather suddenly narrowed into a trigonous, sulcate, rather slender style; stigmas punctiform. *Fruit*, when young, obovoid, narrowed a little at the base, and with the small remains of the sterile carpels at apex; when thoroughly mature, globose, 15-18 mm. in diameter; whole pericarp of the young fruit thin, not quite 2 mm. thick; mesocarp scanty, parenchymatous, slightly fibrous; endocarp easily separating from the mesocarp, very thinly woody; it forms a fragile kernel to the free seed, is globose, frequently slightly irregular, 11-14 mm. in diameter, and very obtusely caudiculate. *Seed* globose 8-10 mm. in diam., erect, with a very dark brown dull surface; hilum small, orbicular; the raphe extends all along one side, and has no visible vascular branches; the integument is somewhat thicker on the raphe side than elsewhere, and enwraps the albumen on that side, but does not penetrate into its substance. Albumen homogeneous, hard, nearly horny; embryo placed about midway of the antiraphe side. *Fruiting perianth* persistent; the hardened calyx forms a distinct terete pedicel and upon it persist the remains of the corolla tube, and of the staminal ring with its recurved filaments.

Habitat.—Cuba and the S. West coast of the Isla de Pinos. In Cuba: *Plantae Cubanae Wrightianae* No. 3964 (Berlin Herbarium); at Herradura Prov. of Pinar del Rio, *Van Hermann* No. 5392, Herb. de Cuba. Estacion central Agronamica (Herb. Beccari and Berlin). On the Isla de Pinos at Nueva Gerona, *W. T. Curtiss*, West Ind. Pl. No. 364 (Herb. de Candolle, Berlin and Munich).

Observations.—It is a most singular palm owing especially to the peculiar appearance of its stem, which, being swollen in its lower portion, looks like an enormous bottle, tapering above into a long neck. I have already pointed out

in "Webbia," (1907) that, as I have not been able to discover any special character by which *Colpothrinax* could be generically separated from the Polynesian species of *Pritchardia*, I have been obliged to reduce it to the latter. I may add that *P. Wrightii* so much resembles its Polynesian parents, even to the peculiar clothing of the lower surface of the leaf-blade, as to leave no doubt of the common origin. This is, I think, one of the most important facts of the geographical distribution of palms.

The principal character that distinguishes *Pr. Wrightii* from its Polynesian relatives consists in its fleshy flowers; moreover, the spadices have the panicles enveloped by two large spathes only; the seed has the thickening of the integument on the raphe side rather pronounced; the surface of the seed is not marked by visible vascular branches, and the embryo is somewhat remotely placed from the base, or almost in the middle of the raphe side.

In the Polynesian Pritchardias the flowers are always of a very hard, nearly woody structure; the spadices have the panicles enwrapped by several imbricating spathes; the thickening of the integument is very slight; the embryo is placed very near to the hilum; and the raphe has on each side 1-3 distinct vascular branches. (In *Pritchardia montis-kea* Rock the embryo is 10 mm. distant from the hilum while in all other Polynesian species the embryo is immediately above the hilum.—J. F. Rock.)

31. PRITCHARDIA KAHANAE Rock et Caum sp. n.[9]

Description.—Trunk 1.5-2 m high, 15 cm. in diameter, decidedly bulbous at the base, 25 cm. in diameter (E. L. Caum). Leaves very rigid, robust; the blade 85 cm. long from the apex of the ligule, segments 52, divided for 35 cm. (median segment), 5.5 cm. in width at their disjunction places; petiole 82 cm. long, 12.5-13 cm. wide at the base, 4.5 cm. wide at the ligule, dark green on the upper surface, covered densely below with silvery confluent lepidia; ligule low crescent-shaped. Spadix simple, about 43 cm. long, including the 12 cm. long panicle, the latter glabrous in flower and in fruit; floriferous branchlets simple, only the lower divided; flowers urceolate, reminding one of those of *Pr. Montis-Kea*, conical, broad at the base (5 mm. in diameter), constricted at the apex, glossy, smooth and puberulous, indistinctly striate near the bluntish teeth; staminal cup protruding one-third the length of the calyx; the filaments short and not spreading. Petals as long as the calyx. Fruit subglobose to globose, black and shining at maturity, about 4 cm. in diameter, rounded at both ends; exocarp thin, the finely fibrous branched mesocarp 4 mm. thick, endocarp thin, less than 1 mm. thick. Seed ovoid, acute at the apex, the embryo immediately above the hilum. Fruiting perianth callous, the remains of the staminal cup spreading.

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[9] Specimens of Nos. 31 and 32 were shown to Professor Rock while he was in Honolulu for a few days on his way from the Orient to Washington. As the monograph was already in press, the author considered it unwise to delay publication indefinitely in order to obtain photographs or to study field relations —*Ed.*

Habitat.—Hawaiian Islands: Oahu, on the windward side of the crest of the Koolau ridge in Kahana Valley, near Puu Kaaumakua. Elevation about 2350 feet. (Collected by Messrs. E. L. Caum, G. A. McEldowney and H. S. Palmer on May 16, 1921. The type is No. 18001 in the herbarium of the Board of Agriculture and Forestry, Honolulu.

Observations.—This species, while related to *Pr. Martii,* differs considerably from it, especially in the globose fruit, thick, urceolate calyx and simple, small spadix.

32. **PRITCHARDIA MARTIOIDES** Rock et Caum sp. n.[9]

Description.—Trunk 4–5 m. high, 15–17.5 cm. in diameter, of even width throughout, with semi-rigid, robust leaves. Petiole 100–110 cm. long, to the apex of the cuspidate ligule, 18–19 cm. wide at the base, 5 cm. wide at the apex; bright green and smooth above, fugaceously tomentose at the base beneath; ligule oblong, cuspidate; leaf-blade (mature) 105 cm. long, segments about 52, 5 cm. wide at their disjunction places, divided to a length of 34 cm. (median segment), with long filaments between the segments, later becoming deciduous; dark green above, covered beneath with confluent hyaline lepidia, of a silvery blue color; lepidia like those of *Pr. Martii.* Spadix simple, 55 cm. long when in fruit, 3.5 cm. wide at the base; panicle simple, 12 cm. long, the two lowest floriferous branchlets again dividing, fugaceously tomentose, floriferous branchlets 9–10 cm. long, 4 mm. thick; flowers arranged spirally; spathes ladle-shaped, 15 cm. long, acute, carinate at the back, with pale brown appressed paleae. Flowers, unopened, 11 cm. long, oblong, bluntly acute; calyx slightly narrowed at the base, glossy, indistinctly striate at the apex; teeth bluntly acute, ciliate; corolla slightly longer (7 mm. long), staminal cup protruding 2 mm., the filaments spreading, of even width and not spreading from a broad base; anthers reflexed at anthesis, linear, versatile; style trigonous, sulcate. Fruit (immature) slightly obovoid, at maturity distinctly oblong, 4.5 cm. long, 2.5–3 cm. in diameter, distinctly ridged, black, shining; exocarp thin, papery; mesocarp 6 mm. thick, finely fibrous, the fibres branching; endocarp bony, 1 mm. thick. Seed oblong, acute at the apex. *Fruiting perianth* subcylindrical.

Habitat.—Hawaiian Islands: Oahu, on the leeward side of the crest of the Koolau ridge near Puu Kaaumakua. Elevation about 2350 feet. Collected by Messrs. E. L. Caum, G. A. McEldowney and H. S. Palmer on May 16, 1921. The type is No. 18000 in the herbarium of the Board of Agriculture and Forestry, Honolulu.

Observations.—This handsome species is related to *Pritchardia Martii,* but differs from it in the very short simple spadix, fugaceously tomentose panicle, the shorter staminal cup, uniformly slender filaments, shorter corolla and ciliate calycine teeth. The fruit is decidedly oblong instead of subglobose.

Imperfectly Known Species.

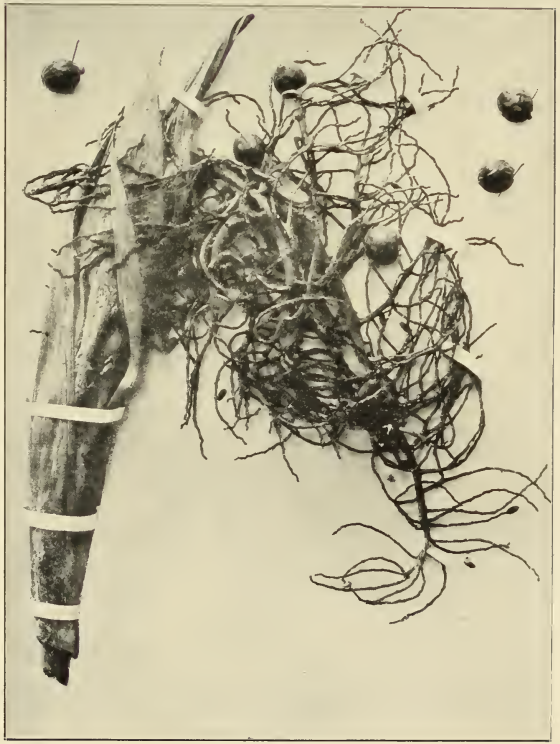
31. **PRITCHARDIA AUREA** Hort. Linden, Revue Hort. 1878, 186; Illustr. Hort. 1881, 32; Becc. in Webbia, II. 207.

I have seen, in the Berlin Herbarium, a few leaves of a palm, labelled with this name by H. Wendland, but differing somewhat from those of any other *Pritchardia* known to me, in the ligula terminating the petiole, which is transverse, or nearly horizontal, unequally lobate, and produced at the sides to sustain the outer most segments; also the blade has the base broadly cuneate; otherwise it is very similar to that of the generality of Pritchardias; its lower surface is sprinkled with small prominent subglandiform, pluricellular, yellowish bodies. I do not know the place of origin of this palm.

A, Pritchardia Thurstonii, F. v. M. et Drude. Cultivated. Kingston, Jamaica. (Photograph by H. L. Lyon.)

B, Pritchardia Wrightii Becc. Growing wild. Cuba. (Photograph by Howard.)

A, Pritcharida Hillebrandi Becc. Cultivated. Kapiolani Park, Oahu.



B, Pritchardia remota Becc. Fruiting branch.

A, Pritchardia affinis Becc. Tree at Kaohe, South Kona, Hawaii. Elevation 1800 Feet.

B, Pritchardia affinis Becc. Fruiting branch. (Type.)

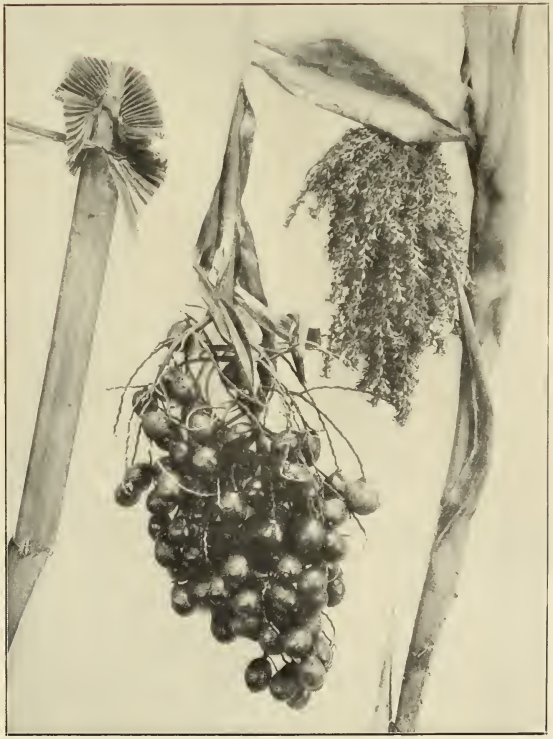
A, Pritchardia affinis var. halophila Becc. Fruiting branch.

B, Pritchardia affinis var. rhopalocarpa Becc. Grounds of Mrs. Lanz, Honolulu. The native habitat South Kona, Hawaii.

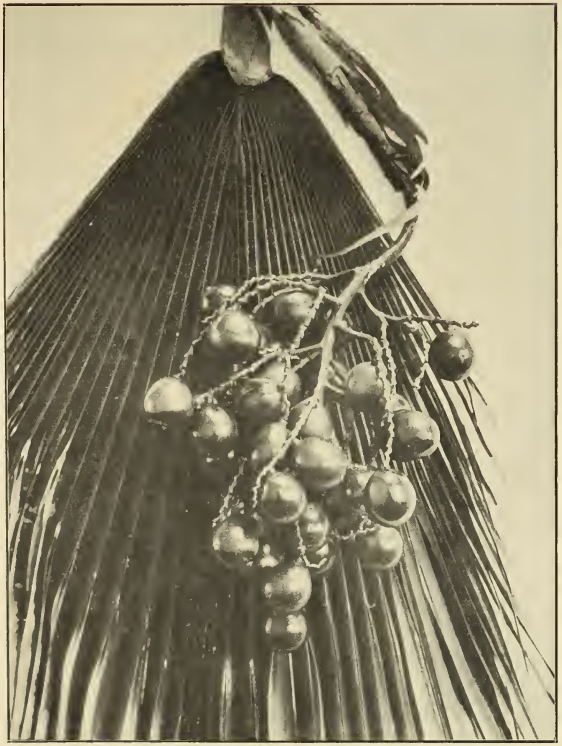
A, PRITCHARDIA LANAIENSIS BECC. ET ROCK. FRUITING BRANCH.

B, PRITCHARDIA ROCKIANA BECC. FRUITING BRANCH.

A, Pritchardia kaalae Rock. Tree at Makaleha Valley, Oahu (the type locality). Elevation about 1500 Feet.



B, Pritchardia kaalae Rock. Fruiting branch.



A, Pritchardia Marth H. Wendl. Fruiting branch.

B, Pritchardia Beccariana var. Giffardiana Becc. Tree in forest above Hilo, Hawaii. Elevation about 2400 feet.

A, Pritchardia Gaudichaudii H. Wendl. Tree on ridge between Waihanau and Waialeia, Molokai. Elevation 3000 feet.

B, Pritchardia Gaudichaudii H. Wendl. Fruiting branch.

A, Pritchardia Forbesiana Rock. Tree at Honokahau Gorge, West Maui. Elevation 4000 feet.

B. Pritchardia Forbesiana Rock. Fruiting branch.

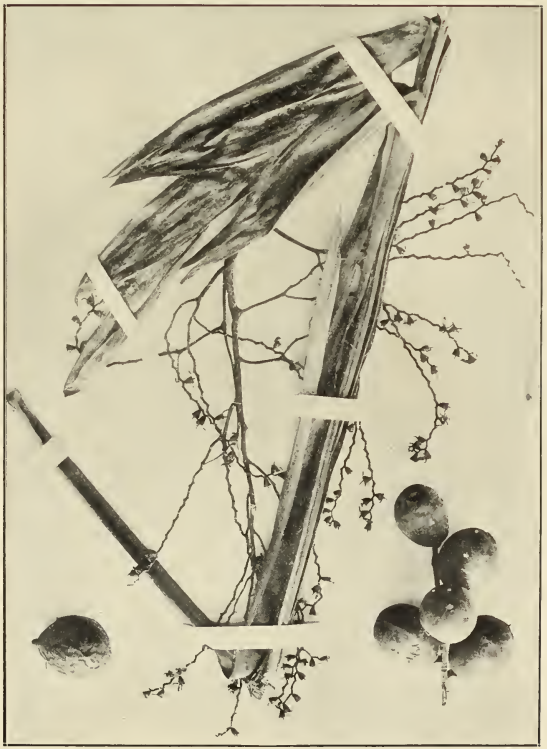
A, Pritchardia Lowreyana Rock. Fruiting branch.

B, Pritchardia Lowreyana var. turbinata Rock. Fruiting branch. (Type.)

A, Pritchardia Beccariana Rock. Tree in forest near Glenwood, Hawaii. One of the tallest species of Pritchardia.

B, Pritchardia Beccariana Rock. Fruiting branch.

A, Pritchardia macrocarpa Linden. Cultivated tree. (Type.) Grounds of Mrs. Mary E. Foster, Honolulu.



B, Pritchardia macrocarpa Linden. Fruiting branch.

A, Pritchardia Hardyi Rock. Tree in forest back of Lihue, Kauai. Elevation 1900 feet.

B, Pritchardia Hardyi Rock. Fruiting branch.

A, Pritchardia Munroi Rock. Tree at Puakoolau-Kamolo, Molokai. (Type.) Elevation 2000 feet.

B, Pritchardia Munroi Rock. Fruiting branch. (Type.)

A, Pritchardia arecina Becc. Fruiting branch.

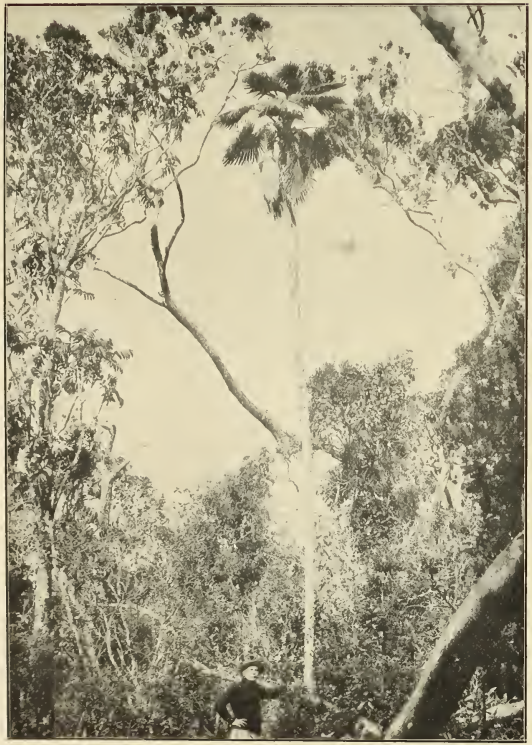
B, Pritchardia viscosa Rock. Fruiting branch. (Type.)

A, Pritchardia montis-kea Rock. Tree on the windward slopes of Mauna Kea between Mana and Honokaa. Elevation about 1800 feet. Cattle have destroyed the forest in this region.

B, Pritchardia montis-kea Rock. Fruiting branch. (type.)

A, Pritchardia lanigera Becc. Fruiting branch.

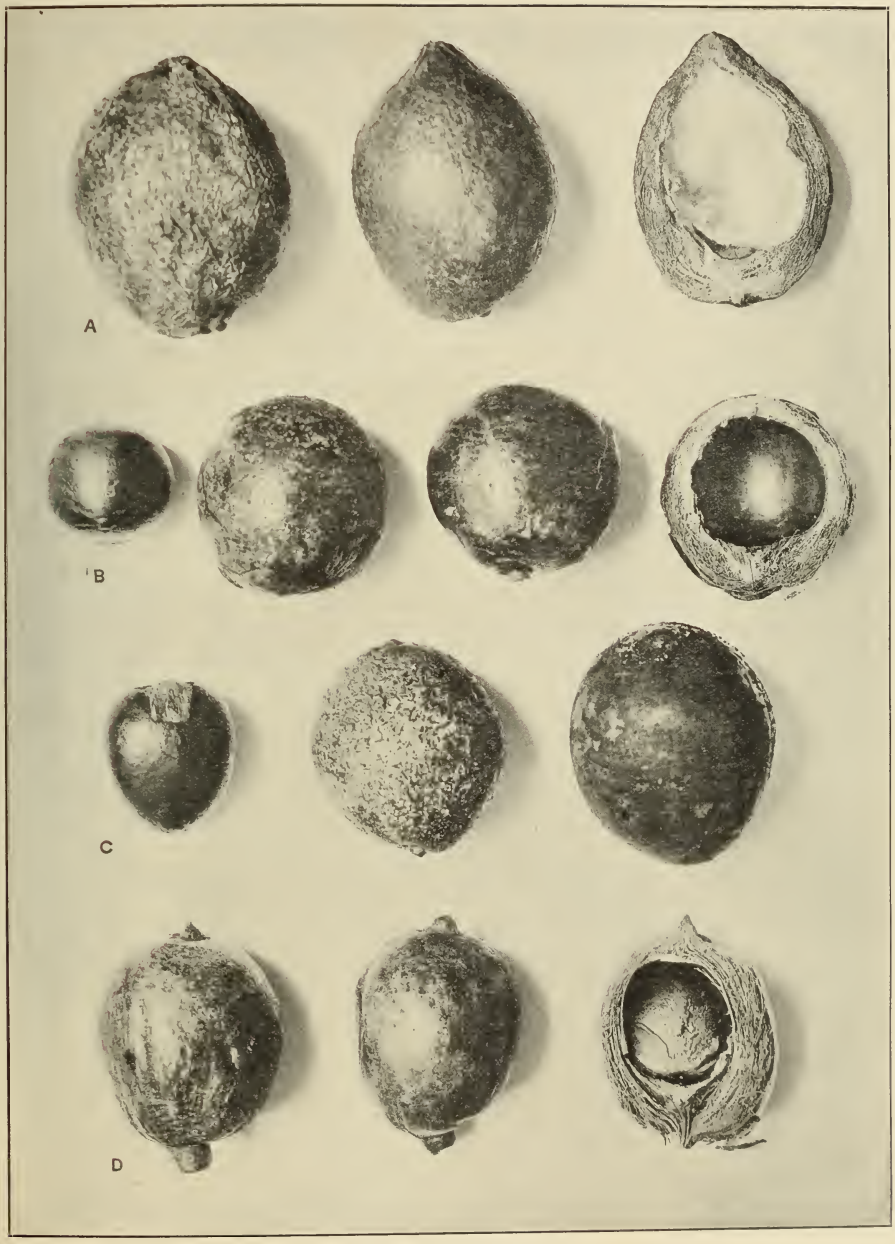
B, Pritchardia eriostachya Becc. Fruiting branch.



A, Pritchardia eriophora Becc. Tree at Kaunoahua near Kalalau, Kauai. Elevation 4200 feet.

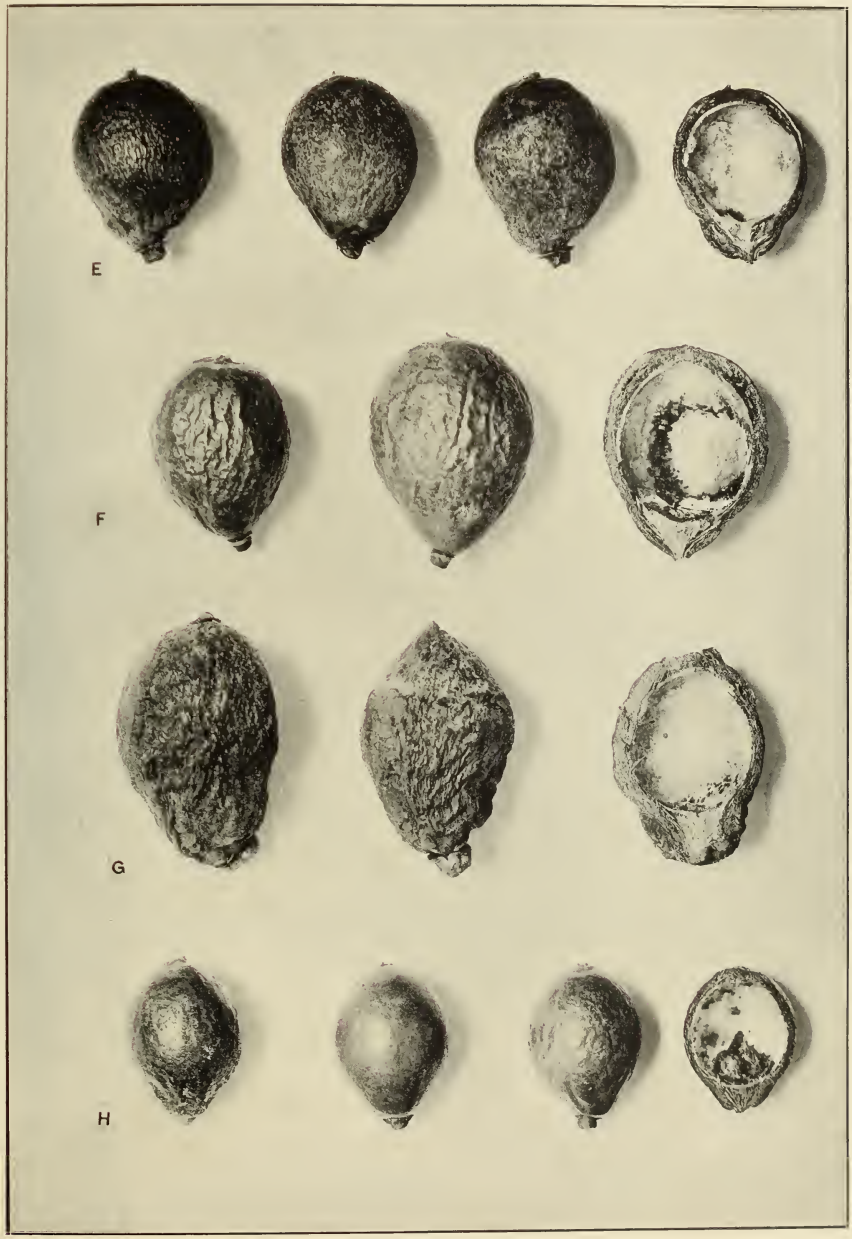
B, Pritchardia eriophora Becc. Fruiting branch.

Pritchardia minor Becc. Fruiting branch.



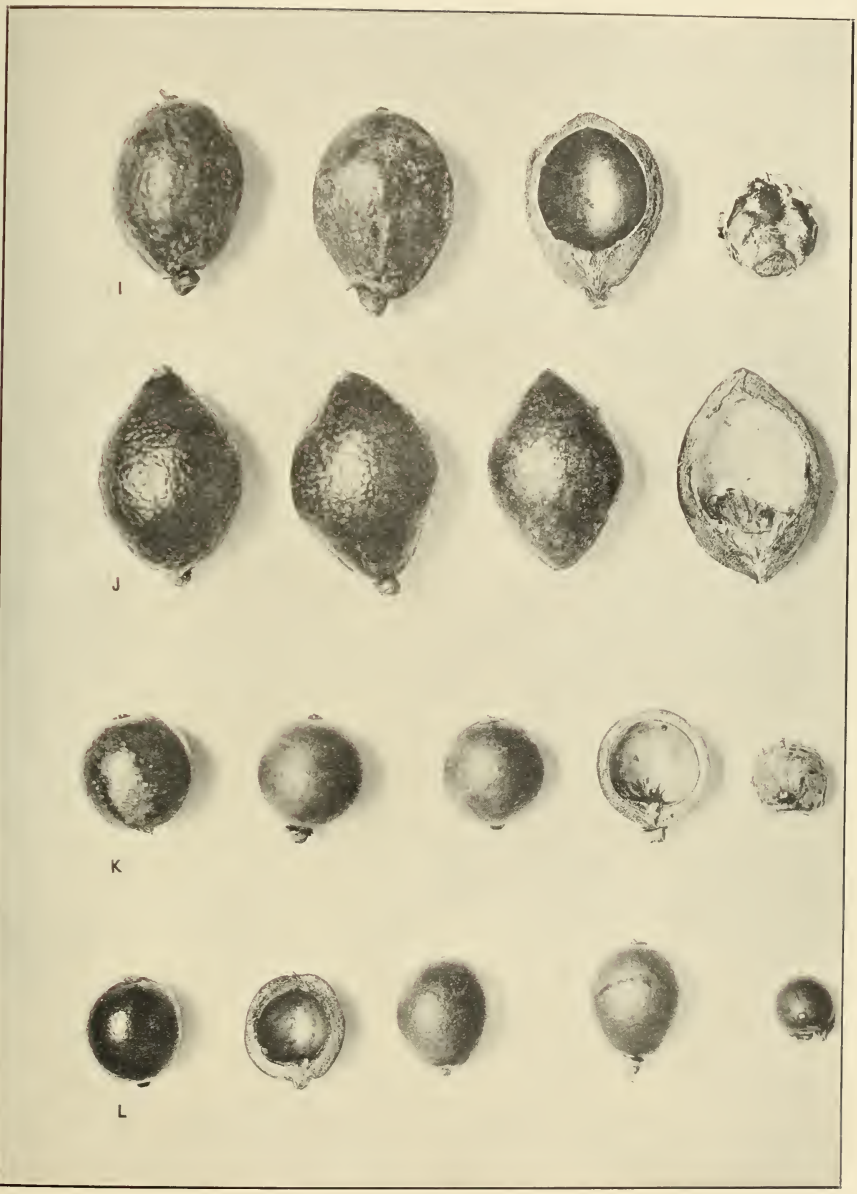
Fruits of Pritchardia.

A, Pritchardia Lowreyana Rock; *B*, Pritchardia Gaudichaudii H. Wendl.; *C*, Pritchardia montis-kea Rock; *D*, Pritchardia arecina Becc. (Natural size.)



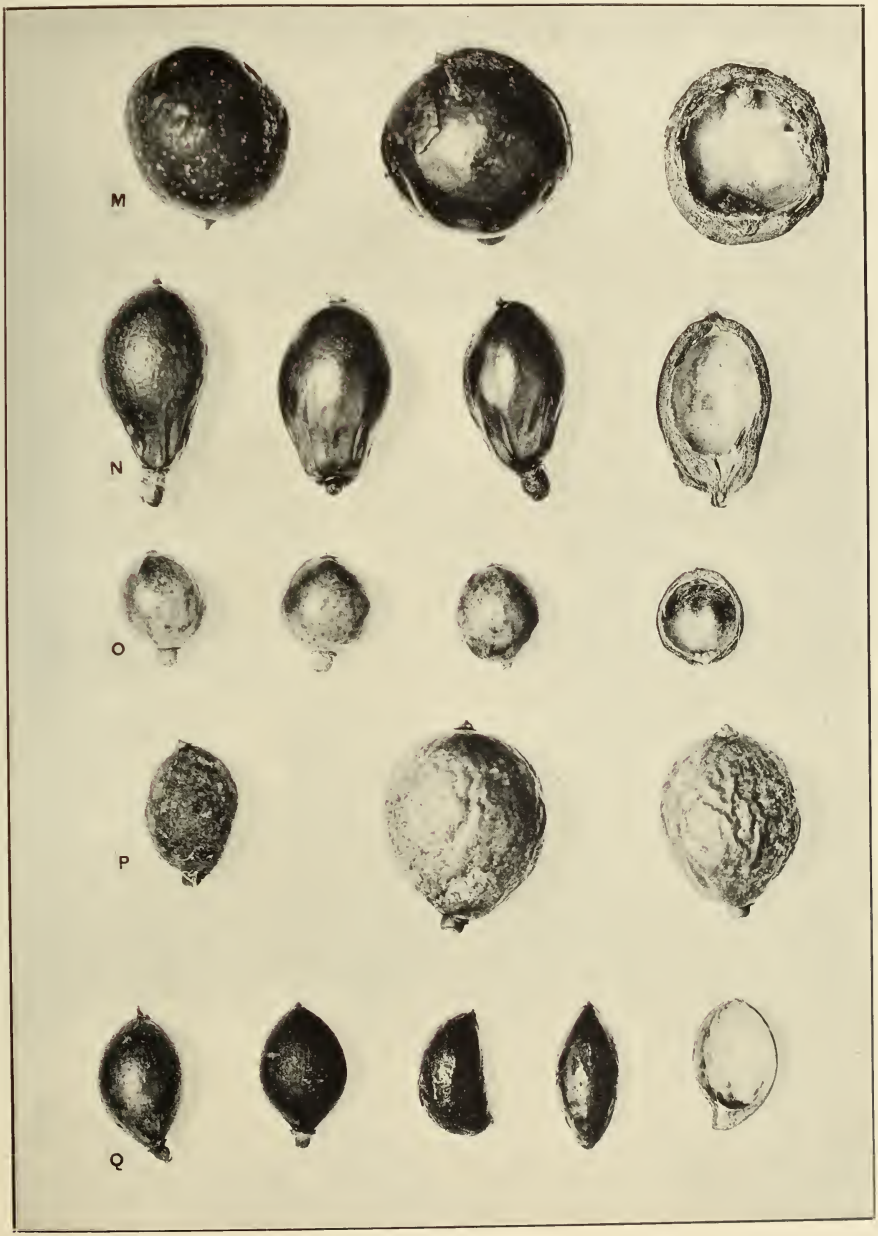
Fruits of Pritchardia.

E, Pritchardia Martii H. Wendl. (from Moanalua Valley, Oahu); *F*, Pritchardia macrocarpa Linden; *G*, Pritchardia Rockiana Becc.; *H*, Pritchardia kaalae Rock. (Natural size.)



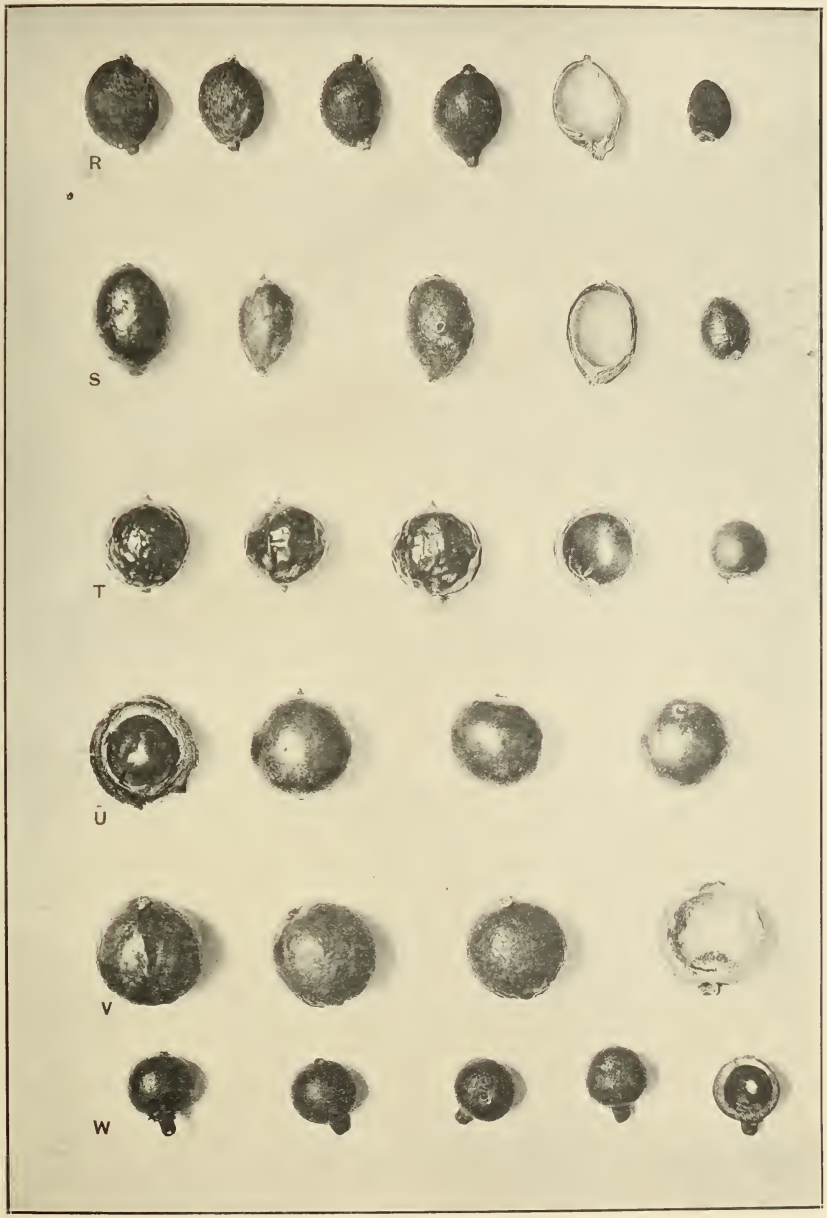
Fruits of Pritchardia.

I, Pritchardia erostachya Becc.; *J*, Pritchardia Lowreyana var. turbinata Rock; *K*, Pritchardia affinis Becc.; *L*, Pritchardia affinis var. rhopalocarpa Becc. (Natural size.)



Fruits of Pritchardia.

M, Pritchardia Beccariana Rock; *N*, Pritchardia viscosa Rock; *O*, Pritchardia remota Becc.; *P*, Pritchardia brevicalyx Becc. et Rock; *Q*, Pritchardia eriophora Becc. (Natural size.)



Fruits of Pritchardia.

R, Pritchardia Hardyi Rock; *S*, Pritchardia minor Becc.; *T*, Pritchardia Hillebrandi Becc.; *U*, Pritchardia Munroi Rock; *V*, Pritchardia lanaiensis Becc. et Rock; *W*, Pritchardia pacifica. (Natural size.)